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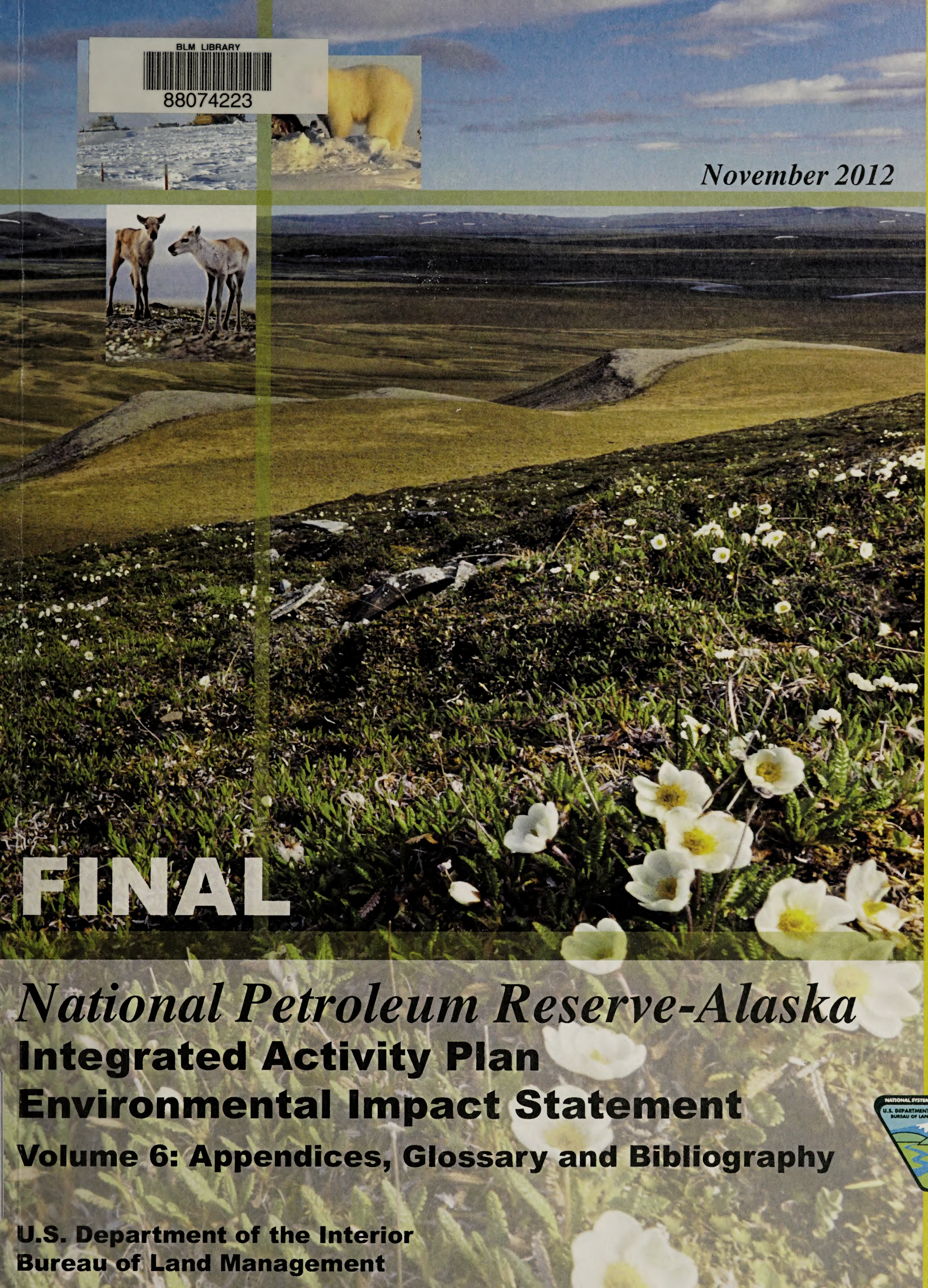

BLM

November 2012

FINAL

National Petroleum Reserve-Alaska
Integrated Activity Plan
Environmental Impact Statement
Volume 6: Appendices, Glossary and Bibliography

Alaska

U.S. Department of the Interior
Bureau of Land Management

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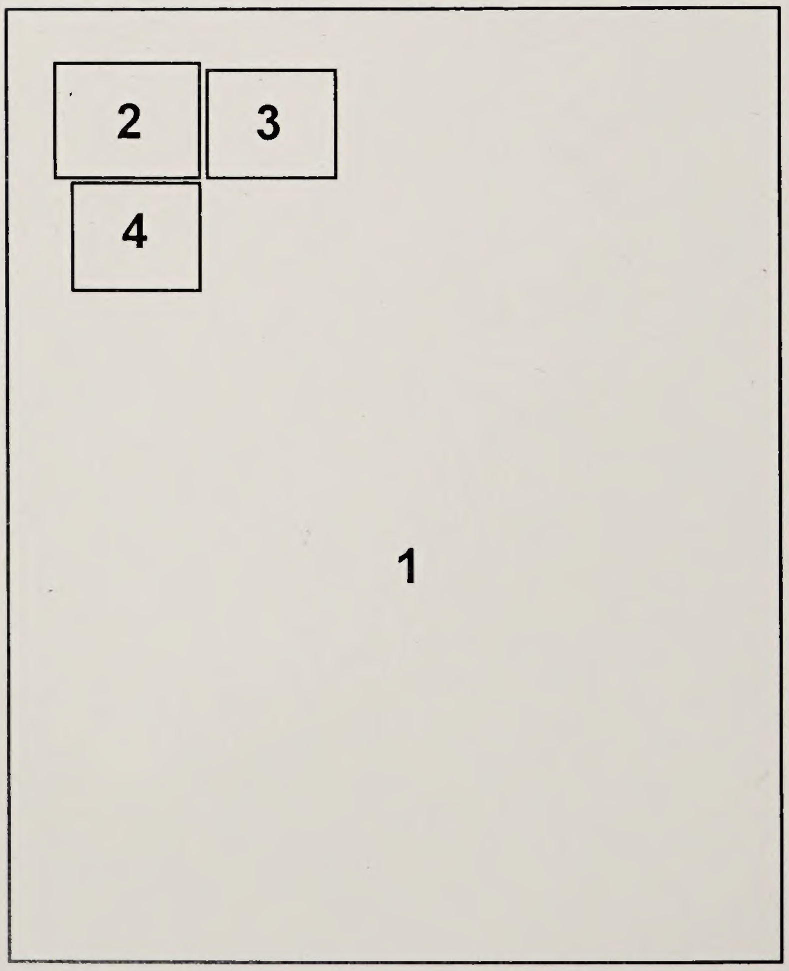

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1. Along the Archimedes Ridge in the Utukok River Uplands of the National Petroleum Reserve-Alaska.
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2. Winter petroleum exploration, National Petroleum Reserve-Alaska. Photo by NSSI

3. Polar Bear, North Slope, Alaska.

4. Two newly born caribou calves in the Utukok River Uplands of the National Petroleum Reserve-Alaska.
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National Petroleum Reserve-Alaska

FINAL

Integrated Activity Plan/ Environmental Impact Statement

Volume 6

Appendices, Glossary, Bibliography

Prepared by:

U.S. Department of the Interior
Bureau of Land Management
Anchorage, Alaska

In cooperation with:

North Slope Borough
U.S. Bureau of Ocean Energy Management
U.S. Fish and Wildlife Service

November 2012

How the IAP/EIS is Organized

VOLUME 1

Chapter 1 – Introduction: Summarizes the purpose of and need for this IAP/EIS and decisions to be made.

Chapter 2 – Alternatives: Describes and compares proposed management alternatives.

Chapter 3 – Affected Environment: Presents existing natural and socioeconomic resources in the NPR-A and trends, including those associated with climate change.

VOLUME 2

Chapter 4 – Environmental Consequences (sections 4.1 – 4.4): Provides the assumptions upon which the impact analysis rests and evaluates impacts of Alternatives A and B-1 on resources and uses in the NPR-A relevant to making a decision among the alternatives.

VOLUME 3

Chapter 4 – Environmental Consequences continued (sections 4.5 – 4.7): Evaluates impacts of Alternatives B-2 (preferred alternative), C, and D on resources and uses in the NPR-A relevant to making a decision among the alternatives.

VOLUME 4

Chapter 4 – Environmental Consequences continued (sections 4.8 – 4.13): Evaluates the cumulative impacts on resources and uses in the NPR-A and other effects relevant to making a decision among the alternatives.

VOLUME 5

Chapter 5 – Consultation and Coordination: Describes public and government (including tribal) consultation undertaken for this plan and the development of alternatives and lists the plan's preparers.

Chapter 6 – Comments and Responses: Presents public comments on the Draft IAP/EIS and responses to the comments.

VOLUME 6

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Appendix A:

ANILCA Section 810 Analysis of Subsistence Impacts

Appendices

Appendix A:

ANILCA Section 810 Analysis of Subsistence Impacts

Appendix A: Alaska National Interest Land Conservation Act (ANILCA) Section 810 Analysis of Subsistence Impacts

This Integrated Activity Plan/Environmental Impact Statement (IAP/EIS) is a comprehensive land use plan for the over 22 million acres of land managed by the BLM in the National Petroleum Reserve in Alaska (NPR-A). The BLM completed a plan for the Northeast NPR-A (4.6 million acres) in 1998. The BLM amended this plan from 2003-2005 and completed a Final Supplemental Plan for the Northeast NPR-A in May 2008. A proposal by Conoco-Philips Alaska, Inc., for oil development in the Northeast NPR-A and the Colville River Delta resulted in the completion of the Alpine Satellite Development Plan in 2004. The BLM also completed a plan for the Northwest NPR-A in 2004, and in 2005, the BLM initiated a plan for South NPR-A that was discontinued in 2007.

Chapters 3 (Affected Environment) and 4 (Environmental Consequences) of the NPR-A Integrated Activity Plan/Environmental Impact Statement provide detailed descriptions of the affected environment of the planning area and the potential adverse effects of the various alternatives to subsistence and to subsistence resources. This appendix uses the detailed information presented in the IAP/EIS to evaluate the potential impacts to subsistence uses pursuant to section 810(a) of the Alaska National Interest Land Conservation Act (ANILCA).

A.1 Subsistence Evaluation Factors

Section 810(a) of ANILCA, 16 USC § 3120, requires that an evaluation of subsistence uses and needs be completed for any federal determination to “withdraw, reserve, lease, or otherwise permit the use, occupancy or disposition of public lands.” As such, an evaluation of potential impacts to subsistence uses under ANILCA § 810(a) must be completed for the NPR-A IAP/EIS. ANILCA requires that this evaluation include findings on three specific issues:

- The effect of use, occupancy, or disposition on subsistence uses and needs;
- The availability of other lands for the purpose sought to be achieved; and
- Other alternatives that would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes (16 USC § 3120).

The evaluation and findings required by ANILCA § 810 are set out for each of the five alternatives considered in the NPR-A IAP/EIS.

A finding that the proposed action may significantly restrict subsistence uses imposes additional requirements, including provisions for notices to the State of Alaska and appropriate regional and local subsistence committees, a hearing in the vicinity of the area involved, and the making of the following determinations, as required by § 810(a)(3):

- Such a significant restriction of subsistence uses is necessary and consistent with sound management principles for the utilization of the public lands;
- The proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of use, occupancy, or other disposition; and,
- Reasonable steps will be taken to minimize adverse effects upon subsistence uses and resources resulting from such actions.

To determine if a significant restriction of subsistence uses and needs may result from any one of the alternatives discussed in the NPR-A IAP/EIS, including their cumulative effects, the following three factors in particular are considered:

- The reduction in the availability of subsistence resources caused by a decline in the population or amount of harvestable resources;
- Reductions in the availability of resources used for subsistence purposes caused by alteration of their normal locations and distribution patterns; and
- Limitations on access to subsistence resources, including from increased competition for the resources.

A significant restriction to subsistence uses may occur in at least two instances:

1. When an action substantially reduces populations or their availability to subsistence users, and,
2. When an action substantially limits access by subsistence users to resources.

Chapter 3 (Affected Environment) of the NPR-A IAP/EIS provides information on areas and resources important for subsistence use, and the degree of dependence of affected villages on different subsistence resource populations. Chapter 4 (Environmental Consequences) provides much of the data on levels of reductions and limitations under each alternative, and is used to determine whether the action would cause a significant restriction to subsistence uses. The information contained in the NPR-A IAP/EIS is the primary data used in this analysis.

A subsistence evaluation and findings under ANILCA § 810 must also include a Cumulative Impacts analysis. Section A.2, below, begins with evaluations and findings for each of the five alternatives discussed in the NPR-A IAP/EIS. Finally, the cumulative case, as discussed in Chapter 4 (Environmental Consequences) of the NPR-A IAP/EIS, is evaluated. This approach helps the reader to separate the subsistence restrictions that would potentially be caused by activities proposed under the five alternatives from those that would potentially be caused by past, present, and future activities that could occur, or have already occurred, in the surrounding area.

When analyzing the effects of the five alternatives, particular attention is paid to those communities who have the potential to be most directly impacted by the proposed actions—Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, and Wainwright. These communities are located within or adjacent to the NPR-A. The cumulative analysis expands the area of potential impact beyond the planning area to include areas in which activities could occur that would impact subsistence users of NPR-A and the subsistence resources that rely upon NPR-A habitat.

In addition to ANILCA, Environmental Justice, as defined in Executive Order 12898, also calls for an analysis of the effects of federal actions on minority populations with regard to subsistence uses. Specifically, Environmental Justice is:

> The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

Section 4-4 of Executive Order 12898 regarding the Subsistence Consumption of Fish and Wildlife requires federal agencies to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence purpsoes, and to communicate to the public any risks associated with the consumption patterns. To this end, the subsistence analyses of all alternatives, located in Chapter 4 (Environmental Consequences) of the NPR-A IAP/EIS, have been reviewed and found to comply with Environmental Justice.

A.2 ANILCA § 810(a) Evaluations and Findings for All Alternatives and the Cumulative Case

The following evaluations are based on information relating to the environmental and subsistence consequences of Alternatives A through D, and the cumulative case as presented in Chapter 4 (Environmental Consequences) of the NPR-A IAP/EIS. The stipulations and required operating procedures/best management practices discussed in Chapter 2 (Alternatives) of the NPR-A IAP/EIS are also considered for the alternatives to which they apply. The evaluations and findings focus on potential impacts to the subsistence resources themselves, as well as access to resources, and economic and cultural issues that relate to subsistence use.

A.2.1 Evaluation and Findings for Alternative A (No-action Alternative)

Alternative A of the NPR-A IAP/EIS is the no-action and is comprised of decisions established in the current records of decision for the Northwest NPR-A (2004) and the Northeast Supplemental IAP (2008). Selection of this alternative would result in a continuation of the BLM's existing management practices in the NPR-A. Alternative A is in effect the preferred alternative from the previous 2004 and 2008 EISs, and as such, a subsistence evaluation as required by ANILCA § 810 has already been completed. However, the 2004 and 2008 IAP/EISs were limited to an analysis of the Northeast and Northwest NPR-A, while the current NPR-A IAP/EIS considers the entire NPR-A. Nevertheless, the evaluation and findings presented here reaffirm the previous conclusion that impacts to subsistence uses as a result of this alternative would be minimal.

A.2.1.1 Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

Under Alternative A, 57 percent (13 million acres) of the National Petroleum Reserve in Alaska could be offered in future oil and gas lease sales. The Required Operating Procedures and lease stipulations defined in the records of decision for the Northeast

Supplemental IAP/EIS (2008) and the Northwest IAP/EIS (2004) would remain in effect. Approximately 2 million acres of the available land would remain deferred from leasing until 2014 or 2018. Teshekpuk Lake and its islands would remain unavailable for leasing. More than 9 million acres in the southern part of NPR-A have not been the subject of an IAP and no oil and gas leasing would occur for these lands in southern NPR-A under Alternative A. A corridor for infrastructure associated with offshore development in the Chukchi Sea could be accommodated.

The analysis of Alternative A on subsistence uses presented in section 4.3.13 ("Subsistence" Alternative A in Volume 2) considers the effects of non-oil and gas activities, the effects of oil and gas activities, the effects of oil spills, and the effectiveness of the stipulations required by the BLM. The analysis concludes that the no-action alternative would have a negligible effect on subsistence species and on access to subsistence resources, and that mitigation measures developed by the BLM in conjunction with local communities would serve to minimize, to the extent possible, impacts to subsistence use by the communities of Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, or Wainwright.

Effects to subsistence resources by non-oil and gas activities consist primarily of those actions associated with research. Numerous studies are conducted on a year-round basis on the North Slope, including aerial surveys by fixed-wing aircraft or helicopter, or ground surveys on foot or by off-highway vehicle, all of which have the potential to disturb animals. The most frequent complaint voiced by local subsistence users is that a large amount of aerial disturbance to animals occurs each field season in conjunction with scientific studies (Subsistence Advisory Panel Minutes, November 16, 2011 meeting and August 22, 2002 meeting). Many of the scientific studies that currently occur are a result of stipulations imposed on oil and gas activities in the planning area; however, these same mandatory stipulations serve to minimize the potential effects of conducting research. Based on the analysis presented in Chapter 4 (Environmental Consequences), the effects of non-oil and gas activities on the species utilized by subsistence users are expected to be localized and short-term, and to have no regional population effects.

Oil and gas-related activities allowed under the no-action alternative include seismic exploration, exploratory drilling, and development/production. Each of these activities has the potential to displace animals, with exploration potentially causing temporary displacement in the area of activity, and development/production potentially causing multi-year displacement during construction and until the animal becomes habituated to the resultant infrastructure. Access by subsistence users could be impacted if the animals they wish to hunt have been displaced to areas much farther from their normal hunting grounds. However, many of the stipulations and ROPs in the 2004 and 2008 records of decision would minimize the effects of oil and gas activities on animal populations, their range, and access to hunting areas by subsistence users (see section 4.3.13.3, "Effectiveness of Stipulations and Required Operating Procedures" in Volume 2).

Oil spills have the potential to impact subsistence species as well as subsistence harvest patterns, depending on the amount and the location of the spill. Small spills are unlikely to cause great damage, especially if contained on land. Large spills are unlikely to occur during the exploration phase of oil development, but could occur once production infrastructure and facilities were in place. Several stipulations and required operating procedures pertaining to spills and spill response are included under the no-action alternative; they serve to reduce the potential impacts of oil spills to subsistence species and use.

A.2.1.2 Evaluation of the Availability of Other Lands for Oil and Gas Exploration and Development

The Naval Petroleum Reserves Production Act of 1976, as amended, gave the Secretary of the Interior the authority to conduct oil and gas leasing in the NPR-A. In 1980, Congress granted the authorization for petroleum production to occur and directed the Secretary of the Interior to undertake a program of competitive leasing of potential oil and gas tracts in the Reserve. The purpose of the NPR-A IAP/EIS is to consider consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve, while providing special protections for specific habitats and site-specific resources and uses, and to ensure that BLM's land management will provide an opportunity, subject to appropriate conditions developed through a NEPA process, to construct necessary onshore infrastructure, primarily pipelines and roads, to bring oil and gas resources from leases in the Chukchi Sea to the Trans-Alaska Pipeline System.

Alternative A would constitute a continuation of the BLM's existing management practices in the NPR-A. No current BLM IAP decisions are effective for the portions of the NPR-A outside of the Northeast and Northwest NPR-A planning areas. State and Native corporation lands cannot be considered in a BLM plan, and under BLM policy other BLM lands outside of Alaska are not considered under ANILCA.

A.2.1.3 Evaluation of Other Alternatives that Would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternatives that would reduce or eliminate the use of public lands needed for subsistence purposes include: (1) making more land in the NPR-A unavailable for oil and gas leasing than is considered in this IAP/EIS, or (2) not allowing oil and gas activity to occur. However, neither of these alternatives would satisfy the underlying purposes of the IAP/EIS to continue a program of competitive leasing of potential oil and gas tracts in the NPR-A and to establish consistent oil and gas leasing stipulations and best management practices across the entire Reserve.

The Secretary of the Interior has directed the BLM to determine the appropriate management of all BLM-managed lands in NPR-A in light of new information about surface and subsurface resources and in a manner consistent with existing statutory direction. Additionally, previous records of decision allowed the BLM to enter into contracts with several oil companies by leasing land for oil and gas exploration. Many of these leases are still in effect. Section 2.4, "Alternatives Considered but Eliminated from Detailed Analysis" in Volume 1 of this IAP/EIS discusses other alternatives that were considered, but eliminated from detailed analysis.

A.2.1.4 Findings

Alternative A would not significantly restrict subsistence uses and needs. The impacts to subsistence resources and access discussed above would be minimal, or would be adequately mitigated by special area designation and stipulations under which the lessee/permittee must operate. This finding applies to Anaktuvuk Pass, Atqasuk, Barrow, Wainwright, Nuiqsut, and Point Lay.

A.2.2 Evaluation and Findings for Alternative B-1

Alternative B-1, including its stipulations and best management practices, emphasizes the protection of surface resources while making nearly 11 million acres of federally owned subsurface (48 percent of the total in the NPR-A) immediately available for oil and gas leasing. It would enlarge three existing Special Areas and create one new Special Area. Alternative B-1 would make approximately 3.1 million acres of a proposed enlarged Teshekpuk Lake Special Area and approximately 8.2 million acres in southwestern NPR-A unavailable for leasing. Major coastal waterbodies would be unavailable for leasing and permanent non-subsistence infrastructure prohibited, with exceptions for a subsurface pipeline under the Wainwright Inlet/Kuk River and for activities and infrastructure necessary to develop existing leases. This alternative would therefore protect subsistence resources and access in critical use areas as well as protecting the wilderness characteristics of the lands. Alternative B-1 would also recommend that 12 rivers be designated for inclusion in the National Wild and Scenic Rivers System. Lands with particularly high surface resource values would receive special protection measures.

A.2.2.1 Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The analysis of Alternative B-1 on subsistence uses is presented in section 4.4.13 ("Alternative B-1, Subsistence"). This analysis considers the effects of non-oil and gas activities, the effects of oil and gas activities, the effects of oil spills, and the effectiveness of the associated stipulations and best management practices as presented by the BLM. The analysis concludes that the effect of Alternative B-1 on subsistence uses would be less than that of Alternative A. Effects would remain localized and would not significantly affect subsistence species, access to subsistence species, or subsistence use by the communities of Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, or Wainwright.

At issue in this evaluation are the differences between Alternative A and Alternative B-1. The smaller amount of oil and gas development projected for Alternative B-1 compared to Alternative A would result in fewer disturbances to subsistence resources, although there are subtle differences among North Slope communities concerning how oil and gas development under Alternative B-1 would impact subsistence uses. Alternative B-1 primarily differs from the no-action alternative in the following regards:

- By making unavailable for leasing and restricting non-subsistence development in coastal waterbodies and in much of a greatly enlarged Teshekpuk Lake Special Area, Alternative B-1 provides significantly more security for key subsistence species and use areas than Alternative A. Making much of the Teshekpuk Lake Special Area unavailable for leasing reduces the risk of direct and indirect impacts to subsistence harvests of Teshekpuk Caribou Herd in Nuiqsut, Barrow, Atqasuk, and Anaktuvuk Pass.
- Alternative B-1 would make the upper portion of the Kasegaluk Lagoon unavailable for leasing and the Kasegaluk Lagoon Special Area would be 77 percent larger than it would be under Alternative A. This provides distinctly more protection to core subsistence use areas for the communities of Point Lay and Wainwright.
- Alternative B-1 provides for a 1.6-million-acre Peard Bay Special Area and prohibits leasing in Peard Bay itself. This provides distinctly more protection to subsistence use areas for the communities of Wainwright, Barrow, and Atqasuk.

- Coastal waterbodies, including Admiralty Bay, Dease Inlet, and Elson Lagoon that are important for Barrow and, to a lesser extent, for Atqasuk would be unavailable for leasing under Alternative B-1.
- The lower sections of both the Chipp and Ikpikpuk rivers and much of the lower section of the Topagaruk River would be unavailable for leasing under Alternative B-1, which are harvest areas important to subsistence users from Barrow.
- Under Alternative B-1, Nuiqsut's subsistence use area would be better protected because Fish Creek, all of the Teshekpuk Caribou Herd's core calving and insect relief area and important waterfowl habitat in the Teshekpuk Lake area, and the Kogru River would be unavailable for leasing.
- Alternative B-1 provides larger setbacks for portions of the Colville, Ikpikpuk, Kikiakrorak, Kogosukruk, and Titalik rivers.
- Alternative B-1 extends the coastal strip between the Kogru River and Tangent Point to 1 mile inland, instead of three-quarters of a mile, in order to protect molting geese habitat as well as summer shoreline habitat for polar bears, walrus, and seals.
- Unlike Alternative A, Alternative B-1 includes a provision (best management practice H-3) that minimizes impacts to important subsistence species by prohibiting employees of the oil and gas industry or other permitted activities to hunt or trap while working. This measure addresses a key concern of subsistence hunters, which is the encroachment of and competition for resources posed by outside hunters.
- Unlike Alternative A, Alternative B-1 makes available the northwest corner of southern NPR-A (i.e., the northwest corner of subarea 230 and the far southwest corner of subarea 130 through which a lower section of the Utukok River flows). Oil and gas activity in this area has the potential to disturb subsistence use by Point Lay and Wainwright subsistence users who travel, hunt, or fish along the Kokolik, Utukok, and upper Ivisaru rivers. Setbacks along rivers would mitigate potential impacts. The subsistence analysis concludes that the other protections provided to these communities under Alternative B-1 (namely making major coastal waterbodies unavailable for leasing) outweigh any potential disruption from this area.

Under Alternative B-1, the greatest difference regarding impacts to subsistence use compared to Alternative A would be the prohibitions of both leasing and the construction of permanent non-subsistence infrastructure in most of an enlarged Teshekpuk Lake Special Area. It is expected that impacts to terrestrial mammals and subsistence use in the vicinity of Teshekpuk Lake would be significantly reduced under Alternative B-1 compared to the no-action alternative, particularly with respect to caribou calving, insect-relief habitat, and migration corridors, given the approximately 2.7 million additional acres that would be unavailable for leasing (see sections 4.4.9.1, "Terrestrial Mammals," and 4.4.13.2, "Subsistence," "Oil and Gas Exploration and Development Activities" in Volume 2). Precluding construction of permanent facilities, such as pipelines, roads, and production pads, within the narrow caribou movement/migration corridors located both to the east and the west of Teshekpuk Lake reduces the risk of displacement of the Teshekpuk Caribou Herd and of dramatic shifts in the current use-area of the caribou.

The primary reason for making most of an enlarged Teshekpuk Lake Special Area under Alternative B-1 unavailable for leasing is to protect important habitat for caribou and birds. Making this area unavailable for leasing will reduce impacts to several species of birds that are important subsistence resources, including white-fronted geese, black brant, and king and common eiders. Protecting the habitat of brant provides greater subsistence resource security for harvesters across the North Slope, in Northwest Alaska, and in the Yukon-Kuskokwim Delta.

A.2.2.2 Evaluation of the Availability of Other Lands for Oil and Gas Exploration and Development

The Naval Petroleum Reserves Production Act of 1976, as amended, gave the Secretary of the Interior the authority to conduct oil and gas leasing in the NPR-A. In 1980, Congress granted the authorization for petroleum production to occur and directed the Secretary of the Interior to undertake a program of competitive leasing of potential oil and gas tracts in the Reserve.

The purpose of the NPR-A IAP/EIS is to consider consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve while providing special protections for specific habitats and site-specific resources and uses, and to ensure that the BLM's land management will provide an opportunity, subject to appropriate conditions developed through a NEPA process, to construct necessary onshore infrastructure, primarily pipelines and roads, to bring oil and gas resources from leases in the Chukchi Sea to the Trans-Alaska Pipeline System.

Alternative B-1 would provide a comprehensive set of land management rules for the entire NPR-A. No current BLM IAP decisions are effective for the portions of the NPR-A outside of the Northeast and Northwest NPR-A planning areas. State and Native corporation lands cannot be considered in a BLM plan, and under BLM policy, no other BLM lands outside of Alaska are considered under ANILCA.

A.2.2.3 Evaluation of Other Alternatives that Would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternatives that would reduce or eliminate the use of public lands needed for subsistence purposes include: (1) making more land in the NPR-A unavailable for oil and gas leasing than is considered in this IAP/EIS, or (2) not allowing oil and gas activity to occur. Neither of these alternatives, however, would satisfy the underlying purposes of the IAP/EIS to continue a program of competitive leasing of potential oil and gas tracts in the NPR-A and to establish consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve. Alternative B-1 reduces the use of public lands needed for subsistence purposes to a greater extent than the other alternatives.

The Secretary of the Interior has directed the BLM to determine the appropriate management of all BLM-managed lands in NPR-A in light of new information about surface and subsurface resources and in a manner consistent with existing statutory direction. Additionally, previous records of decision allowed the BLM to enter into contracts with several oil companies, by leasing land for oil and gas exploration. Many of these leases are still in effect. Section 2.4, "Alternatives Considered but Eliminated from Detailed Analysis" in Volume 1 of this IAP/EIS discusses other alternatives that were considered, but eliminated from detailed analysis.

A.2.2.4 Findings

Alternative B-1 would not significantly restrict subsistence use by communities in or near the NPR-A (Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, and Wainwright). The type of impacts that would occur from non-oil and gas activities and from oil and gas activities under Alternative B-1 would be similar to those that would occur as a result of Alternative A but would be reduced in intensity and duration. Furthermore, adequate stipulations and best management practices have been incorporated in Alternative B-1—including specific procedures for subsistence consultation with directly affected subsistence communities, requirements for extensive studies of caribou movement, and increased setbacks or other protective measures specific to birds—to ensure that significant restrictions to subsistence uses and needs would not occur.

A.2.3 Evaluation and Findings for Alternative B-2

Alternative B-2, including its stipulations and best management practices, emphasizes the protection of surface resources while making nearly 11.8 million acres of federally owned subsurface (52 percent of the total in NPR-A) available for oil and gas leasing. It would enlarge two Special Areas and create one new Special Area. Alternative B-2 would prohibit leasing on approximately 3.1 million acres (85 percent) of an enlarged Teshekpuk Lake Special Area, protecting critical habitat for geese and the Teshekpuk Lake Caribou Herd. Alternative B-2 would prohibit leasing and new non-subsistence infrastructure in all but the northernmost section of the Utukok River Uplands Special Area. Major coastal waterbodies would be unavailable for leasing.

A.2.3.1 Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The analysis of Alternative B-2 on subsistence uses is presented in section 4.5.13, "Alternative B-2, Subsistence" in Volume 3. This analysis considers the effects of non-oil and gas activities, the effects of oil and gas activities, the effects of oil spills, and the effectiveness of the associated stipulations and best management practices as presented by BLM. The analysis concludes that the effect of Alternative B-2 on subsistence uses and needs would be less than that of Alternative A. Effects would remain localized and would not significantly affect subsistence species, access to subsistence species, or subsistence use by the communities of Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, or Wainwright.

At issue in this evaluation are the differences between Alternative A and Alternative B-2. The smaller amount of oil and gas development projected for Alternative B-2 compared to Alternative A would likely result in fewer disturbances to subsistence resources, although there are subtle differences among North Slope communities concerning how oil and gas development under Alternative B-2 would impact subsistence uses. Alternative B-2 primarily differs from the no-action alternative in the following regards:

- By making unavailable for leasing and restricting non-subsistence development in coastal waterbodies and in much of a greatly enlarged Teshekpuk Lake Special Area, Alternative B-2 provides significantly more security for key subsistence species and use areas than Alternative A. Making much of the Teshekpuk Lake Special Area unavailable for leasing reduces the risk of direct and indirect impacts to subsistence harvests of Teshekpuk Caribou Herd in Nuiqsut, Barrow, Atqasuk, and Anaktuvuk Pass.

- Alternative B-2 provides greater setbacks from numerous rivers that are important for subsistence use.
- Alternative B-2 would make the upper portion of the Kasegaluk Lagoon unavailable for leasing.
- Alternative B-2 provides for a 107,000-acre Peard Bay Special Area and would make Peard Bay unavailable for leasing. This provides more protection to subsistence use areas for the communities of Wainwright, Barrow, and Atqasuk.
- Coastal waterbodies, including Admiralty Bay, Dease Inlet, and Elson Lagoon that are important for Barrow and, to a lesser extent, for Atqasuk would be unavailable for leasing under Alternative B-2.
- The area surrounding the lower sections of both the Chipp and Ikpikpuk rivers and much of the lower section of the Topagaruk River, important to subsistence users from Barrow, would be unavailable for leasing under Alternative B-2.
- Under Alternative B-2, Nuiqsut's subsistence use area would be better protected because Fish Creek, all of the Teshekpuk Caribou Herd's core calving and insect relief area, important waterfowl habitat in the Teshekpuk Lake area, and the Kogru River would be unavailable for leasing. The most critical area surrounding Teshekpuk Lake itself would be protected from any new non-subsistence infrastructure.
- Alternative B-2 extends the coastal setback to 1 mile inland, instead of three-quarters of a mile, in order to protect molting geese habitat as well as summer shoreline habitat for polar bears, walrus, and seals. Alternative B-2 also extends this coastal protection zone along the entire coast of the NPR-A.
- Unlike Alternative A, Alternative B-2 includes a provision (best management practice H-3) that minimizes impacts to important subsistence species by prohibiting employees of the oil and gas industry or other permitted activities to hunt or trap while working. This measure addresses a key concern of subsistence hunters, which is the encroachment of and competition for resources posed by outside hunters.
- Unlike Alternative A, Alternative B-2 makes available the northwest corner of southern NPR-A (i.e., the northwest corner of subarea 230 and the far southwest corner of subarea 130 through which a lower section of the Utukok River flows). Oil and gas activity in this area has the potential to disturb subsistence use by Point Lay and Wainwright subsistence users who travel, hunt, or fish along the Kokolik, Utukok, and upper Ivisaru rivers. Setbacks along rivers would mitigate potential impacts. The subsistence analysis concludes that the other protections provided to these communities under Alternative B-2 (no leasing in major coastal waterbodies and no leasing or new non-subsistence infrastructure in all but the northernmost section of the Utukok River Uplands Special Area) outweigh any potential disruption from this area.
- In areas closed to leasing but where new non-subsistence infrastructure would not be prohibited (such as pipelines), several stipulations provide extra protections relevant to that infrastructure.

Under Alternative B-2, the greatest difference regarding impacts to subsistence use would be making most of an enlarged Teshekpuk Lake Special Area unavailable for leasing and the prohibition of leasing and permanent non-subsistence infrastructure in the 27 percent of the Teshekpuk Lake Special Area that is most critical for subsistence resources. It is expected that impacts to terrestrial mammals and subsistence use in the vicinity of Teshekpuk Lake would be reduced under Alternative B-2 compared to the no-action alternative, particularly with respect to caribou calving, insect-relief habitat, and migration corridors (see sections 4.5.9.1, "Terrestrial Mammals," and 4.5.13.2, "Subsistence, Oil and Gas Exploration and Development Activities" in Volume 3). Precluding construction of permanent facilities, such as pipelines, roads, and production pads, within the narrow caribou movement/migration corridors located both to the east and the west of Teshekpuk Lake reduces the risk of displacement of the Teshekpuk Caribou Herd and of dramatic shifts in the current use-area of the caribou.

The primary reason for making most of an enlarged Teshekpuk Lake Special Area under Alternative B-2 unavailable for leasing is to protect important habitat for caribou and birds. Making this area unavailable for leasing will reduce impacts to several species of birds that are important subsistence resources, including white-fronted geese, black brant, and king and common eiders. Protecting the habitat of brant provides greater subsistence resource security for harvesters across the North Slope, in Northwest Alaska, and in the Yukon-Kuskokwim Delta.

A.2.3.2 Evaluation of the Availability of Other Lands for Oil and Gas Exploration and Development

The Naval Petroleum Reserves Production Act of 1976, as amended, gave the Secretary of the Interior the authority to conduct oil and gas leasing in the NPR-A. In 1980, Congress granted the authorization for petroleum production to occur and directed the Secretary of the Interior to undertake a program of competitive leasing of potential oil and gas tracts in the Reserve.

The purpose of the NPR-A IAP/EIS is to consider consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve while providing special protections for specific habitats and site-specific resources and uses, and to ensure that the BLM's land management will provide an opportunity, subject to appropriate conditions developed through a NEPA process, to construct necessary onshore infrastructure, primarily pipelines and roads, to bring oil and gas resources from leases in the Chukchi Sea to the Trans-Alaska Pipeline System.

Alternative B-2 would provide a comprehensive set of land management rules for the entire NPR-A. No current BLM IAP decisions are effective for the portions of the NPR-A outside of the Northeast and Northwest NPR-A planning areas. State and Native corporation lands cannot be considered in a BLM plan, and under BLM policy, no other BLM lands outside of Alaska are considered under ANILCA.

A.2.3.3 Evaluation of Other Alternatives that Would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternatives that would reduce or eliminate the use of public lands needed for subsistence purposes include: (1) making more land in the NPR-A unavailable for oil and gas leasing than is considered in this IAP/EIS, or (2) not allowing oil and gas activity to occur. Neither of these alternatives, however, would satisfy the underlying purposes of the IAP/EIS to continue a program of competitive leasing of potential oil and gas tracts in the NPR-A and to establish consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve. Alternative B-2 reduces the use of public lands needed for subsistence purposes to a greater extent than all other alternatives except for Alternative B-1.

The Secretary of the Interior has directed the BLM to determine the appropriate management of all BLM-managed lands in NPR-A in light of new information about surface and subsurface resources and in a manner consistent with existing statutory direction. Additionally, previous records of decision allowed the BLM to enter into contracts with several oil companies, by leasing land for oil and gas exploration. Many of these leases are still in effect. Section 2.4, "Alternatives Considered but Eliminated from Detailed Analysis" in Volume 1 of this IAP/EIS discusses other alternatives that were considered, but eliminated from detailed analysis.

A.2.3.4 Findings

Alternative B-2 would not significantly restrict subsistence use by communities in or near the NPR-A (Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, and Wainwright). The type of impacts that would occur from non-oil and gas activities and from oil and gas activities under Alternative B-2 would be similar to those that would occur as a result of Alternative A, but would be reduced in intensity and duration. Furthermore, adequate stipulations and best management practices have been incorporated in Alternative B-2—including specific procedures for subsistence consultation with directly affected subsistence communities, requirements for extensive studies of caribou movement, and increased setbacks or other protective measures specific to birds—to ensure that significant restrictions to subsistence uses and needs would not occur.

A.2.4 Evaluation and Findings for Alternative C

Under Alternative C of the NPR-A IAP/EIS, 17.9 million acres (more than three-quarters) of the Petroleum Reserve would be available for oil and gas leasing. Several coastal waterbodies and approximately 4.4 million acres in the far south of the Petroleum Reserve would not be available for oil and gas leasing. Alternative C includes several protective measures that would provide more protection of subsistence use areas than does Alternative A.

A.2.4.1 Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The analysis of the effects of Alternative C on subsistence uses, presented in section 4.6.13 ("Alternative C, Subsistence" in Volume 3) considers the effects of non-oil and gas activities, oil and gas activities, and oil spills, and the effectiveness of the stipulations and best management practices required by the BLM. The analysis concludes that Alternative C would not significantly affect primary subsistence use species, access to subsistence resources, or subsistence use by the communities of Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, and Wainwright. Although, overall, more land within the NPR-A is made available for oil and gas leasing under Alternative C than under Alternative A, the impact of Alternative C on subsistence uses will be less than the impact to subsistence uses under Alternative A, because Alternative C would not allow leasing in several key coastal waterbodies and includes stricter regulations in areas of the Teshekpuk Lake Special Area that would make a larger area unreachable for oil and gas activities. Impacts that would occur under Alternative C are expected to be localized, of short duration, and not significant at the population level for most species.

At issue in this evaluation are the differences between Alternative A and Alternative C. The greater gas development projected for Alternative C compared to Alternative A could result in more acreage being disturbed by development (e.g., approximately 24 percent more acres could be surveyed by seismic under Alternative C than under Alternative A). However, natural gas pipelines, unlike oil pipelines, would be buried and are therefore far less disruptive to subsistence hunters. There are several differences among North Slope communities on how oil and gas development under Alternative C would impact subsistence uses. Alternative C primarily differs from the no-action alternative in the following regards:

- Wainwright's nearby coastal waterbodies (Peard Bay, the Kasegaluk Lagoon, Wainwright Inlet, and the lower section of the Kuk River) would be unavailable for leasing under Alternative C. The preclusion of leasing in that portion of the Kasegaluk Lagoon that is within the NPR-A would result in less impacts to subsistence users from Point Lay.
- Alternative C provides for a 107,000-acre Peard Bay Special Area to protect haul-out areas and nearshore waters for marine mammals, and migration and staging habitat for shorebirds and waterbirds, which as a result, provides extra protections from oil and gas activity in a subsistence area important to both Wainwright and Barrow.
- Although Alternative C provides strong protective measures to reduce impacts on resources from oil and gas activities and thus protects much of the Utukok River Uplands Special Area, the entire southern NPR-A is unavailable for leasing under Alternative A, which, therefore, provides stronger protection for a larger subsistence area south of Wainwright/east of Point Lay. Overall, the preclusion of leasing in nearby coastal waterbodies that is provided by Alternative C would likely prevent more direct impacts to those communities' subsistence resources and use areas than the protections provided by Alternative A.
- Alternative C would protect more of Nuiqsut's subsistence use area by putting in place special restrictions on oil and gas activities around the Kogru River and by increasing the coastal area setback to 1 mile from the west side of the Colville Delta to Tangent Point. Under Alternative C, the Teshekpuk Lake Special Area and the Teshekpuk Lake Caribou Habitat Area are enlarged toward the southeast, overlapping with Nuiqsut's high caribou use area. Alternative C also expands the Teshekpuk Lake Caribou Movement Corridor by 1,500 acres over its size under Alternative A, extending the area where permanent oil and gas facilities, with the exception of pipelines, is prohibited. The restrictions on oil and gas activities in these areas would protect the priority conservation areas (calving area and most of the insect relief area) for the Teshekpuk Caribou Herd, thereby protecting a significant source of food for Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, and Wainwright.
- The amount of land around Teshekpuk Lake that would be rendered unreachable by directional drilling due to restrictions on surface facilities under Alternative C is approximately three times larger than the amount of similarly affected land under

Alternative A. Under Alternative C, the likelihood of Nuiqsut hunters shifting subsistence use areas away from their traditionally used areas around Teshekpuk Lake would be less. The risk of oil and gas activity deflecting caribou away from their normal migration paths in the Teshekpuk Lake Special Area would also be less, and subsistence hunters that depend on the Teshekpuk Caribou Herd would likely save time, energy, and money if they were not required to travel to uncharacteristically distant areas to find caribou.

- Alternative C extends the coastal strip between the Kogru River and Tangent Point to 1 mile inland, instead of three-quarters of a mile, in order to protect molting geese habitat as well as summer shoreline habitat for polar bears, walrus, and seals.
- Unlike Alternative A, Alternative C includes a provision (best management practice H-3) that minimizes impacts to important subsistence species by prohibiting employees of the oil and gas industry or other permitted activities to hunt or trap while working. This measure addresses a key concern of subsistence hunters, which is the encroachment of and competition for resources posed by outside hunters.

Subsistence activities in all NPR-A communities could be directly affected by development activities under Alternative C. Alternative C would make approximately 19 percent more acreage in the NPR-A available to oil and gas leasing than Alternative A, meaning that impacts to subsistence resources and conflicts with subsistence users could occur over a larger area. Alternative C does not provide the same level of protection for the southern NPR-A as Alternative A does, which could result in a significant increase in impacts to the communities of Point Lay and Wainwright if development occurs in their subsistence use areas. However, several small but cumulatively significant changes to borders in the Teshekpuk Lake Special Area would better secure key habitats of the Teshekpuk Caribou Herd. Alternative C also makes several critically important coastal waterbodies unavailable for leasing and provides for a Peard Bay Special Area, actions which protect subsistence access and resources and reduce the risk of oil spills in particularly sensitive environments. Alternative C does not provide the same level of protection for subsistence resources and access that is provided by Alternative B-1, but it provides a greater level than the no-action alternative. Impacts would be localized, of short duration, and not significant at the population level for most species.

A.2.4.2 Evaluation of Availability of Other Lands for Oil and Gas Exploration and Development

The Naval Petroleum Reserves Production Act of 1976, as amended, gave the Secretary of the Interior the authority to conduct oil and gas leasing in the NPR-A. In 1980, Congress granted the authorization for petroleum production to occur and directed the Secretary of the Interior to undertake a program of competitive leasing of potential oil and gas tracts in the Petroleum Reserve.

The purpose of the NPR-A IAP/EIS is to consider consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve, while providing special protections for specific habitats and site-specific resources and uses, and to ensure that the BLM's land management will provide an opportunity, subject to appropriate conditions developed through a NEPA process, to construct necessary onshore infrastructure, primarily pipelines and roads, to bring oil and gas resources from leases in the Chukchi Sea to the Trans-Alaska Pipeline System.

Alternative C would provide a comprehensive set of land management rules for the entire NPR-A. No current BLM IAP decisions are effective for the portions of the NPR-A outside of the Northeast and Northwest NPR-A planning areas. State and Native corporation lands cannot be considered in a BLM plan, and under BLM policy other BLM lands outside of Alaska are not considered under ANILCA.

A.2.4.3 Evaluation of Other Alternatives that Would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternatives that would reduce or eliminate the use of public lands needed for subsistence purposes include: (1) making more land in the NPR-A unavailable for oil and gas leasing than is considered in this IAP/EIS, or (2) not allowing oil and gas activity to occur. However, neither of these alternatives would satisfy the underlying purposes of the IAP/EIS to continue a program of competitive leasing of potential oil and gas tracts in the NPR-A and to establish consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve.

The Secretary of the Interior has directed the BLM to determine the appropriate management of all BLM-managed lands in NPR-A in light of new information about surface and subsurface resources and in a manner consistent with existing statutory direction. Additionally, previous records of decision allowed the BLM to enter into contracts with several oil companies, by leasing land for oil and gas exploration. Many of these leases are still in effect. Section 2.4, “Alternatives Considered but Eliminated from Detailed Analysis” in Volume 1 of this IAP/EIS discusses other alternatives that were considered, but eliminated from detailed analysis.

A.2.4.4 Findings

This evaluation concludes that Alternative C would not significantly restrict subsistence use by communities in or near the NPR-A (Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, and Wainwright). The type of impacts that would occur from non-oil and gas activities and from oil and gas activities under Alternative C would be similar to those that would occur as a result of Alternative A, but would be reduced in intensity and duration. Furthermore, adequate stipulations and best management practices have been incorporated in Alternative C—including specific procedures for subsistence consultation with directly affected subsistence communities, requirements for extensive studies of caribou movement, and increased setbacks or other protective measures specific to birds—to ensure that significant restrictions to subsistence uses and needs would not occur.

A.2.5 Evaluation and Findings for Alternative D

Under Alternative D of the NPR-A IAP/EIS, all land under the stewardship of the BLM within the planning area would be available for oil and gas leasing. Current deferrals would be honored until their respective expiration dates.

A.2.5.1 Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The analysis of the effects of Alternative D on subsistence uses, presented in section 4.7.13 (“Alternative D, Subsistence” in Volume 3), considers the effects of non-oil and gas activities, oil and gas activities, and oil spills, and the effectiveness of the stipulations and best management practices required by the BLM. The analysis concludes that Alternative D may significantly affect primary subsistence species, access to subsistence resources, or subsistence use by the communities of Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay or Wainwright.

Although the types of effects of activities under Alternative D would be identical to those described for Alternative A, Alternative D makes the entire NPR-A, approximately 43 percent more than Alternative A, available for oil and gas leasing. As compared to the other alternatives, the extent, severity, and duration of effects under Alternative D would likely be greater, given that a larger area would be open for year-round occupation and development, which would include ecologically sensitive areas that would not be open under the other alternatives or would be offered greater levels of surface protection under the other alternatives. The impacts of Alternative D would therefore be greater than those of alternatives A, B-1, B-2, or C. Although many impacts would be localized, of short duration, and not significant at the population level for most species, the overall potential for numerous disturbances to critical subsistence species and for conflicts over access to subsistence areas under Alternative D support the conclusion that subsistence use may be significantly affected.

The amount of habitat loss and degradation would be greater under Alternative D than the other alternatives. The most significant changes would be (1) the availability of Teshekpuk Lake and the Teshekpuk Lake Special Area for oil and gas leasing with substantially less protection for surface resources in that area and (2) decreased protection for shorelines and coastal waterbodies. This evaluation considers the potential impacts of Alternative D on birds, fish, and caribou separately before analyzing the overall potential impacts to subsistence uses.

Birds

Under Alternative D, both winter and summer oil and gas activities could result in changes to nesting and molting habitat that affect waterfowl's use of the Petroleum Reserve. In general, Alternative D would allow more infrastructure in areas of very high value to birds than any other alternative and in this aspect would be less protective than the other alternatives and may result in increased habitat loss, disturbance, or mortality. Specific differences between Alternative D and Alternative A that are relevant for birds include:

- Unlike the other alternatives, Alternative D does not prohibit exploration activities in areas that are very important to many migratory species of waterbirds and shorebirds during critical life stages such as migration staging, molting, and breeding (i.e., Teshekpuk Lake, Dease Inlet, Admiralty Bay, Elson Lagoon and associated islands).
- Alternative D has a provision (K-4a) that is designed to minimize disturbance to molting geese habitat by mandating that roads will be designed to minimize impacts to molting geese. This measure is significantly weaker than K-4 under the other alternatives where it prohibits all permanent facilities except pipelines in goose molting habitat.
- Under Alternative D, moderate to large effects to birds could occur in the goose molting area, the entire area of which would be unavailable for oil and gas leasing under the other alternatives.

- The potential for collisions with ground and air traffic would be greater under Alternative D and, because the expected number of sealifts in Alternative D would be higher than in the other alternatives, the impacts from bird collisions with barges would also be higher in Alternative D. Minor effects to individual birds (not populations) are expected to occur from all types of collisions combined.
- Under Alternative D, there would be greater potential for bird mortality due to predation than under any of the other alternatives as there would be more human activity and anthropogenic sources of food available. More nesting and denning sites and hunting perches would be available for predators.
- Birds found in marine habitats (including subsistence species king and common eiders, greater white fronted, Canada and snow geese) within the NPR-A could be particularly susceptible to the negative impacts of an oil spill. The greater need for marine transportation under Alternative D relative to all other alternatives would increase the opportunity for a spill to occur.
- Alternative D could result in the greatest amount of permanent and temporary bird habitat loss. Gravel mining and placement for the construction of oil and gas field infrastructure would have the greatest potential to result in the permanent loss of bird habitat. Temporary loss of tundra habitat adjacent to gravel roads and pads could occur as a result of thermokarst, dust deposition, snow accumulation, water withdrawals (if recharge does not occur), and impoundment formation.

Fish

Alternative D could result in an increased likelihood that fish and fish habitats could be affected by development activities that could potentially reduce fish populations, divert fish from their normal locations, or contaminate fish populations and habitat. Specific differences between Alternative D and the other alternatives that are relevant for fish include:

- Alternative D has no comparable provisions that would provide additional protection to the Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk River, and Kasegaluk Lagoon.
- Under Alternative D, NPR-A lands available for leasing include 34,100 miles of potential stream habitat: 92 percent more than Alternative A.
- The incidence of impacts on fish occurring from seismic surveys under Alternative D (77,562 surveying miles) would be 43 percent more than under Alternative A, 33 percent more than Alternatives B-1 and B-2, and 9 percent more than Alternative C.
- Expected incidence of impacts on fish from winter oil and gas activities under Alternative D (114,794 ice road/snow trail miles) would be 41 percent more than Alternative A, 97 percent more than Alternative B-1, 83 percenter more than Alternative B-2, and 6 percent more than Alternative C.
- The degree of foreseeable impacts on fish from year-round domestic freshwater demand under Alternative D (168 oil and gas production pads) would be 50 percent more than Alternative A, 110 percent more than Alternative B-1, 50 percent greater than Alternative B-2, and 13 percent more than Alternative C.

- The incidence of impacts on fish from roads and pipelines and associated activities under Alternative D would be 73 percent more than Alternative A, 108 percent more than Alternative B-1, 91 percent more than Alternative B-2, and 3 percent more than Alternative C.
- The incidence of impacts on fish related to gravel pads and airstrips under Alternative D (239 gravel pads and airstrips) would be 48 percent more than Alternative A, 102 percent more than Alternative B-1, 89 percent more than Alternative B-2, and 8 percent more than Alternative C.

Caribou

In general, Alternative D would have a higher probability of causing a population-level effect to one or both of the Teshekpuk Caribou Herd and Western Arctic Herd. Impacts to caribou from roads and pipelines; motor vehicle, aircraft, and foot traffic; and habitat alteration associated with gravel mining and construction would be greater under Alternative D than under other alternatives, given the larger development scenario. Disturbance could directly affect about 60 percent more acres of habitat under long-term disturbance as compared to Alternative A. Functional loss of habitat would be greater than the actual development footprint. Wolfe (2000) suggested that when caribou in the Central Arctic Herd avoided areas within 2.5 miles of roads and pipelines, the functional habitat loss increased from 2 percent (the immediate footprint of roads and gravel pads) to 29 percent.

If a field were developed in the area surrounding Teshekpuk Lake, production pads, pipelines, within-field roads, and other facilities would be located within areas used by the Teshekpuk Caribou Herd for calving, insect relief, and wintering. A field development in the northern section of the NPR-A would also require a connector pipeline to link the oil field with facilities to the east, further affecting the Teshekpuk Lake area and possibly impeding movements until the Teshekpuk Caribou Herd habituates to its presence (Person et al. 2007). Post-parturient caribou and calves could be deflected or diverted from preferred habitats in the vicinity of Teshekpuk Lake if development were to occur in that area (Murphy and Lawhead 2000).

Unlike the other alternatives, Alternative D has no provision to protect the Teshekpuk Lake Southern Caribou Calving Area and Alternative D has the highest probability of resulting in development within the calving grounds of the Teshekpuk Caribou Herd. Therefore, Teshekpuk Herd caribou could be exposed to oil and gas development facilities and activities at a time of year when they are most sensitive to disturbance. Wilson et al. (2011) showed that significant portions of high quality calving habitat could be lost to the Teshekpuk Caribou Herd as a result of development. This suggests that if Teshekpuk Caribou Herd females are displaced from part or all of the current calving area, parturient females would be unlikely to find similar areas elsewhere across their range. This situation could result in reduced calving success and negatively affect the Teshekpuk Caribou Herd at the population level.

Unlike the other alternatives, Alternative D has no provision to protect Teshekpuk Lake Caribou Movement Corridors. Migrating caribou could be delayed or deflected by aircraft traffic and other human activity during development and construction. As discussed in section 3.4.3, “Subsistence” in Volume 1, Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, and Wainwright depend on the Teshekpuk Caribou Herd as a subsistence species. Even a temporary disruption of these communities' harvest patterns would have negative effects for subsistence users.

Climate change could make foraging more difficult on herbivores during winter, possibly causing negative, synergistic effects to mammals when combined with disturbance and displacement of mammals by oil and gas activities.

Subsistence

The increased activity that could occur over a wider area under Alternative D could inhibit subsistence users from harvesting in their traditional use areas to a greater degree than all other alternatives. The avoidance of traditionally used subsistence areas due to development and aircraft use would likely be accompanied by anxiety over this loss and by reduced subsistence harvests. Oil infrastructure on the east side of the Colville River has resulted in the nonuse of this area by the residents of Nuiqsut who do not feel comfortable hunting near or around oil developments. Hunters could avoid the development if enough economically recoverable oil and/or gas were discovered to warrant additional development in the traditional subsistence use areas of Atqasuk, Barrow, Nuiqsut, Point Lay, or Wainwright. The result would be an overall reduction in lands used for subsistence purposes.

The deflection of caribou and other important subsistence resources from areas of activity would result in increased difficulty harvesting caribou and other subsistence resources and the necessity to make longer and more distant trips in order to have a successful harvest. These factors would increase the cost, risk, and time commitment subsistence harvesting entails. Decreased opportunities to harvest terrestrial mammals could be especially problematic if climate change inhibits fall travel by delaying freeze up or causes subsistence species to shift their migration routes or schedules. If climate change causes Arctic Ocean ice to retreat farther from the shore, it will make the harvesting of whales and other marine mammals more difficult, which could in turn increase pressure to harvest terrestrial subsistence foods. Specific differences between Alternative D and Alternative A that are particularly relevant for subsistence uses include:

- Alternative D has no provision that would protect fish and wildlife habitat, subsistence cabins, and subsistence activities by prohibiting permanent oil and gas facilities on the shores of Teshekpuk Lake, Dease Inlet, Admiralty Bay and Elson Lagoon.
- Alternative D has no provision comparable to K-8, which protects subsistence resources and traditional access in the Kasegaluk Lagoon Special Area.
- Alternative D does not provide the same level of protection for the southern NPR-A as Alternative A does, which could result in impacts to the communities of Point Lay and Wainwright if development occurs in their subsistence use areas. The lower level of protection for the Western Arctic Herd under Alternative D, particularly the potential for development near the calving grounds of the Western Arctic Herd, decreases the food security of the over 40 Alaskan communities thatharvest those animals.
- Unlike Alternative A, Alternative D includes a provision (best management practice H-3) that minimizes impacts to important subsistence species by prohibiting employees of the oil and gas industry or other permitted activities to hunt or trap

while working. This measure addresses a key concern of subsistence hunters, which is the encroachment of and competition for resources posed by outside hunters.

Alternative D has the greatest potential to impact subsistence use of all the alternatives. The proposed stipulations and best management practices can effectively mitigate most potential impacts resulting from oil and gas activity. However, if the optimistic levels of development predicted for Alternative D occur, the amount of disturbance to subsistence uses NPR-A-wide would be significant.

A.2.5.2 Evaluation of the Availability of Other Lands for Oil and Gas Exploration and Development

The Naval Petroleum Reserves Production Act of 1976, as amended, gave the Secretary of the Interior the authority to conduct oil and gas leasing in the NPR-A. In 1980, Congress granted the authorization for petroleum production to occur and directed the Secretary of the Interior to undertake a program of competitive leasing of potential oil and gas tracts in the Petroleum Reserve.

The purpose of the NPR-A IAP/EIS is to consider consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve, while providing special protections for specific habitats and site-specific resources and uses, and to ensure that the BLM's land management will provide an opportunity, subject to appropriate conditions developed through a NEPA process, to construct necessary onshore infrastructure, primarily pipelines and roads, to bring oil and gas resources from leases in the Chukchi Sea to the Trans-Alaska Pipeline System.

Alternative D would provide a comprehensive set of land management rules for the entire NPR-A. No current BLM IAP decisions are effective for the portions of the NPR-A outside of the Northeast and Northwest NPR-A planning areas. State and Native corporation lands cannot be considered in a BLM plan, and under BLM policy other BLM lands outside of Alaska are not considered under ANILCA.

A.2.5.3 Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternatives that would reduce or eliminate the use of public lands needed for subsistence purposes include: (1) making more land in the NPR-A unavailable for oil and gas leasing than is considered in this IAP/EIS, or (2) not allowing oil and gas activity to occur. However, neither of these alternatives would satisfy the underlying purposes of the IAP/EIS to continue a program of competitive leasing of potential oil and gas tracts in the NPR-A and to establish consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve.

The Secretary of the Interior has directed the BLM to determine the appropriate management of all BLM-managed lands in NPR-A in light of new information about surface and subsurface resources and in a manner consistent with existing statutory direction. Additionally, previous records of decision allowed the BLM to enter into contracts with several oil companies, by leasing land for oil and gas exploration. Many of these leases are still in effect. Section 2.4, "Alternatives Considered but Eliminated from Detailed Analysis" in Volume 1 of the IAP/EIS discusses other alternatives that were considered, but eliminated from detailed analysis.

A.2.5.4 Findings

This evaluation concludes that the action may result in significant restriction to subsistence use for the communities of Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, and Wainwright due to the potential for widespread development in the NPR-A and the likelihood of development in particularly sensitive areas that can be expected to result in a substantial reduction in the opportunity to continue subsistence uses of renewable resources caused by a major redistribution of resources and/or extensive interference with access. Most separate impacts to subsistence resources would likely be minimal. However, displacement of the Teshekpuk Lake Herd could occur and this impact would be significant. Most importantly, Alternative D could result in a scenario where a multitude of minor impacts to subsistence species and minor disturbances to access to subsistence areas could occur in many locations within the NPR-A. If this occurred, the overall impact to the subsistence system as a result of widespread disturbance would likely be substantial.

A.2.6 Evaluation and Findings for the Cumulative Case

The goal of the cumulative analysis is to evaluate the incremental impact of the current action in conjunction with all past, present, and reasonably foreseeable future actions in or near the planning area. The cumulative analysis considers in greatest detail activities that are more certain to happen, and activities that were identified as being of great concern during scoping. Oil and gas activities considered in the analysis include past development and production, present development, and reasonably foreseeable future development. Activities not associated with oil and gas are also considered. All reasonably foreseeable future activities that may contribute to cumulative effects are considered in this analysis.

Actions included in the cumulative analysis include, but are not limited to the following:

- Road and pipeline between Umiat Area and Dalton Highway
- Chukchi Sea development
- Beaufort Seas development
- A corridor to the Ambler mining district
- Commercial gas pipeline
- Conventional oil and gas development in the Colville-Canning Area
- Unconventional oil and gas development in the Colville-Canning Area
- Spills and gas releases
- Contribution of IAP/EIS alternatives to cumulative effects

Moreover, these actions are considered in light of the shifting environmental conditions presented by climate change.

A.2.6.1 Evaluation of the Effect of Such Use, Occupancy, or Disposition on Subsistence Uses and Needs

Section 4.8, "Cumulative Effects" in Volume 4 of the IAP/EIS contains a detailed description of the cumulative-case scenario, including past effects, present effects, and the future possible oil field and infrastructure development upon which this evaluation is based. This assessment and finding assumes that all future development in the NPR-A would be subject to the stipulations and best management practices or required operating procedures incorporated into the alternatives analyzed in the IAP/EIS. The cumulative analysis expands the area of potential impact beyond the planning area to include areas in which activities could occur that would impact subsistence users of NPR-A and the subsistence resources that rely upon NPR-A habitat. Additionally, the impacts to subsistence use of migratory species, such as waterfowl, are also discussed.

The extent of expected cumulative effects on subsistence resources and subsistence access and other activities would vary depending on the alternative selected under this IAP/EIS. The analysis of the effects of the cumulative case on subsistence presented in section 4.8.7.13, "Cumulative Effects: Subsistence" in Volume 4 indicates that, irrespective of the alternative selected, cumulative activity on the North Slope has the potential to significantly restrict subsistence use for the communities of Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, and Wainwright. Subsistence resources also have the potential to be impacted under the cumulative case.

Cumulative effects on caribou distribution and abundance are likely to be long-term, lasting as long as the life of the oil fields. Any reduction in the calving and summer habitat use by cows and calves from future onshore leasing would represent a functional loss of habitat that could result in long-term effects on the caribou herds' productivity and abundance.

The effects of oil and gas activities in the NPR-A would be greatest on those herds that use the Reserve, specifically the Teshekpuk Caribou Herd and Western Arctic Herd. Currently, the Teshekpuk Caribou Herd is the primary source of caribou for the communities of Atqasuk, Barrow, Nuiqsut, Wainwright, and possibly Anaktuvuk Pass. Any substantial decrease in the population numbers of this herd would have a substantial impact on all five communities. If the decrease occurred during times of unsuccessful bowhead whaling, the effects would be devastating for Atqasuk, Barrow, Nuiqsut, and Wainwright. The additional development pressure envisioned by the cumulative-case scenario could exacerbate changes in abundance and productivity of caribou, and these changes could, in turn, adversely affect subsistence harvests.

Foreseeable development with the potential to affect the NPR-A includes an all-season industrial gravel road to connect Umiat in southeast NPR-A with the Dalton Highway. The Corps of Engineers is currently the lead agency on an EIS for the proposal and is considering several alternative routes. Unless a route is selected where public access is restricted, there are likely to be important effects on subsistence resources by non-oil and gas use of the road, which could cut across north-south migration paths and potentially affect animals in the Teshekpuk Caribou Herd and Central Arctic Herd during some autumn and spring migration. Depending on the route selected, the road could provide increased access to caribou by non-local hunters and, if hunting were not appropriately managed, this could result in a cumulative increase in caribou mortality. Also, caribou may adapt to the presence of a road in a way that does not substantially affect the herds, but may have a substantial effect on subsistence hunters that rely on specific paths of movement by migrating caribou. The Umiat road and pipeline would also increase the likelihood of additional impacts to fish to the east of the NPR-A and within the NPR-A because permanent infrastructure (e.g., roads, pads, pipelines, and causeways) and gravel mining are likely to continue contributing to changes in natural drainage patterns and water quality, alternations to physical habitat, barriers to fish movement, and increased water pollution. The road could also lead to synergistic pressures on fish in the Colville

River and its tributaries due to greater use of the area for sport and subsistence fishing. Widespread opposition to the road in the North Slope Borough is based on the belief that it would effectively preclude a viable subsistence lifestyle in Anaktuvuk Pass and that it would encourage further development along an east-west line that will bifurcate the Arctic Slope, creating impacts to subsistence uses in other NPR-A communities.

Foreseeable development in the NPR-A could include onshore facilities on the Chukchi Sea coast and could extend across the entirety of the NPR-A via a pipeline that would tie into Trans-Alaska Pipeline System. Foreseeable development in the Beaufort Sea would require onshore pipelines and could require onshore processing facilities in the northeastern NPR-A that would impact Teshekpuk Caribou Herd caribou. The support infrastructure for offshore activities could make it economically profitable to extract oil and gas reserves from areas within the NPR-A which would otherwise not be economically recoverable, causing a synergistic increase in disturbance sources within the NPR-A. In this scenario, the NPR-A could, to some degree, be divided by one or two strips of industrial development. There is the potential for this scenario to have a significant impact on subsistence resources and access to those resources. Furthermore, infrastructure built for coastal onshore oil and gas activities could also encourage offshore development, creating a self-reinforcing system.

Offshore oil activity in the Chukchi and Beaufort seas could cause whales to change their travel routes, which would make subsistence whaling more dangerous and less successful. A significant reduction in bowhead whaling would have serious negative impacts on Iñupiaq communities, which are socially organized around whaling crews and whaling celebrations. The offshore development and transport that is possible under the cumulative case increases the risk of oil spills in the marine environment. Any oil spill that tainted, or was perceived to taint, whales or other marine mammals of importance to subsistence users would have a significant negative effect on those users. If such a spill affected migration patterns or distributions of any marine mammal used for subsistence, it would also have significant negative effect on subsistence users.

Areas east of Point Lay, south and east of Wainwright, and surrounding Atqasuk could experience development of natural gas. Development is in the planning stages for the Colville River Delta north of Nuiqsut to an area southwest of the village, which would effectively encircle the community, making it necessary for subsistence hunters traveling in nearly every direction to pass through some kind of development on the way to traditional subsistence harvest areas. Because Iñupiaq hunters are reluctant to use firearms near oil production facilities and pipelines, there would be a perceived barrier to harvest in these areas. Subsistence users currently avoid the Kuparuk and Meltwater areas because of the physical barriers pipelines and elevated gravel roads pose to winter snowmachine travel, and have expressed concerns about hunting close to oil production and processing facilities because of perceived regulatory barriers (ENSR 2004, Nukapigak 2012). Additionally, many community members fear contamination of their subsistence resources by oil production facilities.

Effects on subsistence harvest patterns from natural gas development and production could occur from natural gas blowouts, noise and traffic disturbance, and construction activities under any of the alternatives. Subsistence hunters, who already tend to avoid oil field infrastructure, may be even more likely to avoid aboveground gas pipelines for fear of a blowout. Noise and disturbance activities due to the development of a gas field, especially to caribou, would be local (within 3 to 4 km of the pipeline corridor) but would persist for the life of the field. A much greater impact from a gas pipeline would be effects from additional gas development that a pipeline would make possible (already analyzed under the five alternatives) within and to the east and west of NPR-A. Commercial gas production on the North Slope would likely result in more infrastructure in the foothills area and in the subsistence use areas of Point Lay, Atqasuk, and Wainwright, thus increasing the area that subsistence users are likely to avoid and the habitat for subsistence species that may be impacted. Permanent facilities will likely compel subsistence hunters to travel further to harvest game at a greater cost in terms of time, fuel, wear and tear on equipment and people, and lost wages.

For analysis purposes, the IAP/EIS assumes that the North Slope Borough population would fluctuate over time reflecting oil and gas production rates. If onshore and offshore oil and gas production in the North Slope increases as predicted, the population will grow at a rate of approximately 2 percent per year until the end of the century. The effects of such growth on competition for subsistence resources are difficult to predict, but it is possible that over time there would be increased competition among local subsistence users.

The effects of global climate change on marine mammals are unclear, but may result in more ship traffic in the Beaufort over a longer ice-free season, commercial fisheries in the Chukchi and Beaufort, and displacement and distributional changes, if not population changes, among marine mammals. Climate change is likely to have the greatest influence on marine mammal populations in and adjacent to the planning area; however, species' resilience as well as feedback and interactions remain highly uncertain. Estimating the incremental addition of direct human activities (disturbance, hunting and habitat alteration) remains speculative, but climate change by itself is likely to have significant effects on the marine mammal community of the Beaufort and Chukchi Seas. The reduction of sea ice has exacerbated coastal erosion, weather has become less predictable, the shore ice in spring is less stable for whaling, fall travel for caribou is hampered by a late and unreliable freeze up, ice cellars provide less reliable food storage, and the number of marine mammals that are experiencing habitat loss is apparent. If permafrost loss increases as predicted, there could be synergistic cumulative effects on infrastructure, travel, landforms, sea ice, river navigability, habitat, availability of fresh water, and availability of terrestrial mammals, marine mammals, waterfowl and fish, all of which could necessitate relocating communities or their population, shifting the population to places with better subsistence hunting and causing a loss or dispersal of community residents (National Research Council 2003, Arctic Climate Impact Assessment 2004).

A.2.6.2 Evaluation of the Availability of Other Lands for Oil and Gas Exploration and Development

The Naval Petroleum Reserves Production Act, as amended, gives the Secretary of the Interior the authority to conduct oil and gas leasing in the NPR-A. However, the law prohibited petroleum production from occurring in the NPR-A until authorized by Congress. In 1980, Congress granted that authorization and directed the Secretary of the Interior to undertake a program of competitive leasing of potential oil and gas tracts in the Reserve. The BLM is undertaking this NPR-A IAP/EIS to fulfill the BLM's responsibilities to manage these lands under authority of the Naval Petroleum Reserves Production Act and Federal Land Policy and Management Act and to consider consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve, while providing special protections for specific habitats and site-specific resources and uses, and to ensure that BLM's land management will provide an opportunity, subject to appropriate conditions developed through a NEPA process, to construct necessary onshore infrastructure, primarily pipelines and roads, to bring oil and gas resources from leases in the Chukchi Sea to the Trans-Alaska Pipeline System. Other lands managed by the BLM are either too remote for economically viable oil and gas production, or have a low probability of containing sufficient quantities of oil or gas. State and Native corporation lands cannot be considered in a BLM plan, and other BLM lands outside of Alaska are not considered under the ANILCA as per BLM Policy.

A.2.6.3 Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternatives that would reduce or eliminate the use of public lands needed for subsistence purposes include: (1) making more land in the NPR-A unavailable for oil and gas leasing than is considered in this IAP/EIS, or (2) not allowing oil and gas activity to occur. However, neither of these alternatives would satisfy the underlying purposes of the IAP/EIS to continue a program of competitive leasing of potential oil and gas tracts in the NPR-A and to establish consistent oil and gas leasing stipulations and best management practices across the entire Reserve.

The Secretary of the Interior has directed the BLM to determine the appropriate management of all BLM-managed lands in NPR-A in light of new information about surface and subsurface resources and in a manner consistent with existing statutory direction. Additionally, previous RODs allowed the BLM to enter into contracts with several oil companies, by leasing land for oil and gas exploration. Many of these leases are still in effect. Section 2.4, "Alternatives Considered but Eliminated from Detailed Analysis" in Volume 1 of the IAP/EIS discusses other alternatives that were considered, but eliminated from detailed analysis.

A.2.6.4 Findings

The cumulative case as presented in this analysis, when taken in conjunction with all alternatives, would result in a reasonably foreseeable and significant restriction of subsistence use for the communities of Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, and Wainwright, due to a decrease in resource abundance, significant alteration in the distribution of resources, and a significant restriction on the access of subsistence users. This finding requires a positive determination pursuant to ANILCA § 810.

The distribution of caribou populations on the North Slope has been affected by Prudhoe Bay development, and access to subsistence resources has been compromised there. Although procedures will be in place to ensure that future development affects access as little as possible, it is still probable the total area available for subsistence purposes will be reduced. If a major marine oil spill were to occur in the future, it could significantly affect both populations and distributions of fish, and whales and other marine animals, causing significant restrictions to subsistence use of these resources. Oil and gas infrastructure located in core caribou calving or insect-relief areas would result in the displacement, and possible reduction, of the herd. Population growth may result in a greater number of residents relying on local resources to meet their needs. These restrictions have the potential to affect Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, and Wainwright.

A.3 Notice and Hearings

ANILCA § 810(a) provides that no “withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected” until the federal agency gives the required notice and holds a hearing in accordance with ANILCA § 810(a)(1) and (2). The BLM will provide notice in the Federal Register that it made positive findings pursuant to ANILCA § 810 that Alternative D and the cumulative case presented in the NPR-A IAP/EIS, when taken in conjunction with all alternatives, met the “may significantly restrict” threshold. As a result, public hearings were held in the potentially affected communities of Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Lay, and Wainwright. Notice of these hearings was provided in the Federal Register and by way of the local media, including the Arctic Sounder newspaper, and KBRW, the local Barrow radio station with coverage to all villages on the North Slope.

A.4 Subsistence Determinations Under ANILCA § 810(a)(3)(A), (B), and (C)

ANILCA § 810(a) provides that no “withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected” until the federal agency gives the required notice and holds a hearing in accordance with ANILCA §810(a)(1) and (2), and makes the three determinations required by ANILCA § 810(a)(3)(A), (B), and (C). The three determinations that must be made are: (1) that such a significant restriction of subsistence use is necessary, consistent with sound management principles for the utilization of the public lands; (2) that the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other such disposition; and (3) that reasonable steps will be taken to minimize adverse impacts to subsistence uses and resources resulting from such actions [16 U.S.C. § 3120(a)(3)(A), (B), and (C)].

The BLM has found in this subsistence evaluation that Alternative D and the cumulative case considered in this IAP/EIS for all alternatives would significantly restrict subsistence uses. Therefore, the BLM has undertaken the notice and hearing procedures required by ANILCA § 810 (a)(1) and (2) in conjunction with release of the Draft NPR-A IAP/EIS in order to solicit public comment from the potentially affected communities and subsistence users.

The determinations below satisfy the requirements of ANILCA § 810(a)(3)(A), (B), and (C).

A.4.1 Significant Restriction of Subsistence Use is Necessary, Consistent with Sound Management Principles for the Utilization of Public Lands

BLM is undertaking this NPR-A IAP/EIS to fulfill BLM’s responsibilities to manage these lands under authority of the Naval Petroleum Reserves Production Act and Federal Land Policy and Management Act and to consider consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve, while providing special protections for specific habitats and site-specific resources and uses. In addition, the IAP/EIS will provide the opportunity, subject to appropriate conditions developed through a NEPA process, to construct necessary onshore infrastructure, primarily pipelines and roads, to bring oil and gas resources from leases in the Chukchi Sea to the Trans-Alaska

Pipeline System or a future gas pipeline from the North Slope. The Naval Petroleum Reserves Production Act authorizes and directs the Secretary of the Interior to “further explore, develop and operate” the National Petroleum Reserve-Alaska (10 U.S.C. § 7421). At the same time, the statute also requires that all oil and gas activities “undertaken pursuant to this section shall include or provide for such conditions, restrictions, and prohibitions as the Secretary deems necessary or appropriate to mitigate reasonably foreseeable and significantly adverse effects on the surface resources” of the National Petroleum Reserve – Alaska (42 U.S.C. § 6508).

It was in furtherance of these objectives, together with other management guidance found in the Naval Petroleum Reserves Production Act, Federal Land Policy and Management Act, NEPA, and ANILCA that this IAP/EIS was undertaken. After considering a broad range of alternatives, Alternative B-2 was developed to fulfill the purpose and need of this planning effort, while incorporating protective measures that serve to minimize impacts to important subsistence resources and subsistence-use areas. Alternative B-2 considers the necessity for economically feasible development while providing effective protections to minimize any impacts on subsistence resources and uses. Under Alternative B-2, the lease stipulations and best management practices that accompany the alternative serve as the primary mitigation measures to be used to reduce the impact of the proposed activity on subsistence uses and resources.

The BLM has considered and balanced a variety of factors with regard to the proposed activity on public lands, including, most prominently, the comments received during the public meetings and hearings which stressed the importance of protecting essential caribou movement/migration corridors for both the Teshekpuk Lake and Western Arctic caribou herds. The BLM has determined that the significant restriction that may occur under Alternative B-2, when considered together with all the possible impacts of the cumulative case, is necessary, consistent with sound management principles for the use of these public lands, and for BLM to fulfill the management goals for the Planning Area as guided by the statutory directives in the Naval Petroleum Reserves Production Act, Federal Land Policy and Management Act, and other applicable laws.

A.4.2 The Proposed Activity will Involve the Minimal Amount of Public Lands Necessary to Accomplish the Purposes of such Use, Occupancy or Other Disposition

The BLM has determined that Alternative B-2 involves the minimal amount of public lands necessary to accomplish the purposes of the planning effort—namely, to consider consistent oil and gas leasing stipulations and best management practices across the entire Petroleum Reserve, while providing special protections for specific habitats and site-specific resources and uses, and allowing the opportunity for necessary infrastructure to support oil and gas exploration and development. Alternatives that varied between opening no additional lands, less additional lands, some additional lands, or all lands to leasing were analyzed. Alternative B-2, including its stipulations and best management practices, emphasizes the protection of surface resources while making nearly 11.8 million acres of federally owned subsurface (52 percent of the total in NPR-A) available for oil and gas leasing. Alternative B-2 would make approximately 11 million acres of the NPR-A unavailable for oil and gas leasing. It would enlarge two Special Areas and create one new Special Area. Alternative B-2 makes unavailable for leasing approximately 3.1 million acres of an enlarged Teshekpuk Lake Special Area, protecting critical habitat for geese and the Teshekpuk Lake Caribou

Herd. Approximately 7.3 million acres in southwestern NPR-A would also be unavailable; they include important calving and insect-relief habitat for the Western Arctic Caribou Herd. Major coastal waterbodies that are integral for subsistence uses and needs such as Admiralty Bay, Wainwright Inlet, Peard Bay, and Kasegaluk Lagoon are unavailable for leasing.

A.4.3 Reasonable Steps will be Taken to Minimize Adverse Impacts upon Subsistence Uses and Resources Resulting from such Actions.

When BLM began its NEPA scoping process for the current plan, it internally identified subsistence as one of the major issues to be addressed. The information found within the analysis of impacts to subsistence, including access, harvests, and traditional use patterns, as well as the results of public scoping meetings in the villages of the North Slope, meetings with the National Petroleum Reserve – Alaska Subsistence Advisory Panel, and consultation with tribal and local governments (especially the North Slope Borough, a cooperating agency), were used to craft Alternative B-2. In addition, the BLM took into consideration comments from villages and individuals of the North Slope during the ANILCA Subsistence Hearings. This information resulted in the retention and addition of several protective measures that further minimize adverse impacts to subsistence uses and resources. They include:

- Best management practice A-11 specifically addresses contaminants in subsistence foods and requires baseline data be collected prior to any development, as well as monitoring during operation through the abandonment phase. Additionally, best management practice A-12 addresses contaminant monitoring of subsistence foods should an oil spill with potential to impact human health occur within the NPR-A.
- Best management practice E-1 addresses access to subsistence resources and the protection of resource habitats by requiring that all roads must be designed, constructed, maintained, and operated to create minimal environmental impacts and to protect subsistence use and access to subsistence hunting and fishing areas. Similarly, Lease Stipulation E-3 sets the requirement for the construction of dock and causeways so as not to impede fish passage or subsistence access. Best management practice E-7 sets forth the requirements for pipelines and associated roads in order to allow the free movement of caribou and access to subsistence users.
- Best management practice F-1 addresses aircraft use by permittees in the NPR-A and sets forth altitude requirements for flying over multiple species at various times during the year, as well as BLM expectations for aircraft use near subsistence cabin and camps and during sensitive subsistence hunting periods.
- Best management practice H-1 requires consultation by permittees with communities that are potentially affected by their proposed activity in order to ascertain any traditional knowledge or other input that could be used to minimize impacts to subsistence use. The best management practice also requires applicants to submit a subsistence plan to the BLM that discusses the results of their consultation, and that steps they are taking to minimize the impacts identified; requires a monitoring plan to be developed for permanent facilities to assess potential effects of the development to subsistence resources and users; and requires permittees to consult with the Alaska Eskimo Whaling Commission and other local whaling entities when their proposal includes barge use.

- Best management practice H-2 addresses conflicts between subsistence users and seismic exploration by requiring seismic operators to communicate the timing, extent, and location of activity to subsistence users; and prohibits seismic activity from within 1 mile of any known subsistence cabin or camp.
- Best management practice H-3 address competition for resources by prohibiting permittees, their employees, agents or contractors from hunting or trapping while on work status.
- Lease stipulation/Best management practice K-1 creates setbacks along various rivers within the NPR-A where no permanent oil and gas facilities will be able to be constructed. Rivers that are considered especially important for subsistence use have a minimum 1-mile setback on either side of the river.
- Lease stipulation/Best management practice K-2 prohibits permanent oil and gas facilities from within 0.25 mile of deep water lakes. This protects fish, waterfowl, and subsistence cabins or camps that may be located on the lake.
- Lease stipulation K-6 prohibits exploratory well pads, production well pads or central processing facilities from coastal waters and 1 mile from the coast inland, protecting subsistence users and resources.

Given these steps, as well as the other lease stipulations and best management practices that serve to directly protect various subsistence resources or their habitat, the BLM has determined that Alternative B-2 includes reasonable steps to minimize adverse impacts on subsistence uses and resources.

Appendix B:

Federal, State, and Local Permits and/or Approvals for Oil and Gas Exploration, Development, and Production Activities

Appendix B: Federal, State, and Local Permits and/or Approvals for Oil and Gas Exploration, Development, and Production Activities

The following table summarizes permit and other requirements that must be met before oil and gas exploration or development activities may occur. Some obligations would be placed directly on the applicant. Others would be required of federal agencies prior to granting authorizations to oil and gas companies.

Table B–1. Federal, State and local requirements, permits and approvals for oil and gas exploration, development and production activities

Regulatory agency	Permit/approval actions/requirements
FEDERAL	
National Oceanic and Atmospheric Administration (NOAA) Fisheries Service (formerly National Marine Fisheries Service [NMFS])	• Provides consultation under the Endangered Species Act of 1973, Section 7(a)(2) regarding effects to threatened or endangered species. • Provides consultation under the Magnuson-Stevens Fishery Management and Conservation Act for effects on Essential Fish Habitat. • Provides consultation under the Fish and Wildlife Coordination Act regarding effects on fish and wildlife resources. • Provides consultation under the Marine Mammal Protection Act regarding effects on marine mammals. • Issues Incidental Harassment Authorization under the Marine Mammal Protection Act for incidental takes of protected marine mammals (bowhead whales and ringed seals).
U.S. Army Corps of Engineers (USACE)	• Issues a section 404 permit under the Federal Water Pollution Control Act of 1972, as amended (Clean Water Act; 33 USC § 1344) for discharge of dredged and fill material into waters of the U.S, including wetlands. • Issues a section 10 permit under the Rivers and Harbors Appropriations Act of 1899 (33 USC § 403) for structures or work in, of affecting, navigable waters of the U.S. • Issues a section 103 Ocean Dumping permit under section 103 of the Marine Protection Research and Sanctuaries Act of 1972 (33 USC § 1413) for transport of dredged material for ocean disposal.
U.S. Bureau of Land Management (U.S. BLM)	• Reviews and approves Applications for Permit to Drill (including drilling plans and surface-use plans of operations) and Subsequent Well Operations as prescribed in 43 CFR part 3160, under authority of the Naval Petroleum Reserves Production Act of 1976 (42 USC §§ 6501-6508) and other Federal laws, for development and production of Federal leases. • Approves lease administration requirements including Unit Agreements and Plans of Development, Communitization Agreements, and Participating Area Determinations, as described in 43 CFR parts 3130 and 3180, under the Mineral Leasing Act of 1920 (30 USC §§ 181 et seq.), Federal Oil and Gas Royalty Management Act of 1982 (43 USC §§ 1701 et seq.), Naval Petroleum Reserves Production Act of 1976, Department of the Interior Appropriations Act, Fiscal Year 1981(Public Law 96-514), and other Federal laws, for exploration and development of oil and gas leases. • Issues geophysical permits to conduct seismic activities as described in 43 CFR part 3150, under authority of the Mineral Leasing Act of 1920,

Table B–1. Federal, State and local requirements, permits and approvals for oil and gas exploration, development and production activities

Regulatory agency	Permit/approval actions/requirements
	Alaska National Interest Lands Conservation Act (16 USC §§ 3101 et seq.), Federal Land Policy and Management Act of 1976 (43 USC §§ 1701 et seq.), Naval Petroleum Reserves Production Act of 1976, and Department of the Interior Appropriations Act, Fiscal Year 1981. • Issues rights-of-way grants and temporary use permits for the construction, operation, and maintenance of pipeline, production, and related facilities under the Naval Petroleum Reserves Production Act of 1976. • Delegates authority to ADEC for review and approval of Oil Discharge Prevention and Contingency Plans and Certification of Financial Responsibility for accidental oil discharge into navigable waters under section 1016 of the Oil Pollution Act of 1990 (OPA90; 33 USC § 2716), and Section 311(j)(5) of the Federal Water Pollution Control Act (33 USC § 1321(j)(5); 30 CFR part 254).
U.S. Environmental Protection Agency (USEPA)	• Issues a National Pollutant Discharge and Elimination System (NPDES) permit under section 402, Federal Water Pollution Control Act of 1972, as amended (Clean Water Act; 33 USC § 1342) for discharges into waters of the U.S. Authority for administering this program is being transferred to the State of Alaska in phases, with the last phase, Phase IV, scheduled to be transferred on October 31, 2012. • Issues an Underground Injection Control Class 1 Industrial Well permit under the Safe Drinking Water Act (42 USC §§ 300f et seq.; 40 CFR parts 144 and 146) for underground injection of Class I (industrial) waste materials. • Requires a Spill Prevention Containment and Countermeasure (SPCC) Plan under section 311 of the Federal Water Pollution Control Act of 1972, as amended (Clean Water Act; 33 USC § 1321;40 CFR part 112) for storage of over 660 gallons of fuel in a single container or over 1,320 gallons in aggregate in tanks above ground. • Requires a Facility Response Plan (FRP) under the Clean Water Act as amended (Oil Pollution Act; 33 USC 40) to identify and ensure the availability of sufficient response resources to respond to the worst case discharge of oil to the maximum extent practicable. • Conducts a review and evaluation of the Draft and Final EIS for compliance with CEQ guidelines (40 CFR parts 1500-1508) and section 309 of the Clean Air Act (42 USC § 7609). • Authority delegated to ADEC to issue air quality permits for facilities operating within state jurisdiction, including a Title V operating permit and a Prevention of Significant Deterioration (PSD) permit under the Clean Air Act, as amended (42 USC §§ 7401 et seq.), to address air pollutant emissions.
U.S. Fish and Wildlife Service (USFWS)	• Provides consultation under the Endangered Species Act of 1973, section 7(a)(2) regarding effects to threatened or endangered species. • Provides consultation under the Fish and Wildlife Coordination Act regarding effects to fish and wildlife resources. • Issues a Letter of Authorization under the Marine Mammal Protection Act for incidental takes of marine mammals.

Table B–1. Federal, State and local requirements, permits and approvals for oil and gas exploration, development and production activities

Regulatory agency	Permit/approval actions/requirements
STATE	
Alaska Department of Environmental Conservation (ADEC)	• Issues a Certificate of Reasonable Assurance for discharge of dredged and fill material into U.S. waters under section 401, Federal Water Pollution Control Act of 1972, as amended in 1977 (Clean Water Act; 33 USC § 1341); AS 46.03.020; 18 AAC chapters 15, 70, and 72. • Issues a Certificate of Reasonable Assurance/NPDES and Mixing Zone Approval for wastewater disposal into all state waters under section 402, Federal Water Pollution Control Act of 1972, as amended (Clean Water Act; 33 USC § 1342); AS 46.03.020, .100, .110, .120, and .710; 18 AAC chapters, 10, 15, and 70, and ; § 72.500. • Issues a Class I well wastewater disposal permit for underground injection of non-domestic wastewater under AS 46.03.020, .050, and .100. • Reviews and approves all public water systems including plan review, monitoring program, and operator certification under AS 46.03.020, .050, .070, and .720, 18 AAC § 80.005. • Approves domestic wastewater collection, treatment, and disposal plans for domestic wastewaters (18 AAC chapter 72). • Approves financial responsibility for cleanup of oil spills (18 AAC chapter 75). • Reviews and approves the Oil Discharge Prevention and Contingency Plan and the Certificate of Financial Responsibility for storage or transport of oil under AS 46.04.030 and 18 AAC chapter 75. The State review applies to oil exploration and production facilities, crude oil pipelines, oil terminals, tank vessels and barges, and certain non-tank vessels. • Issues a Title V Operating Permit and a PSD permit under Clean Air Act Amendments (Title V) for air pollutant emissions from construction and operation activities (18 AAC chapter 50). • By May 2013 will receive authorization from EPA to issue NPDES permits under section 402, Federal Water Pollution Control Act of 1972, as amended (Clean Water Act; 33 USC § 1342) for discharges into waters of the U.S. • Issues solid waste disposal permit for state lands under AS 46.03.010, 020, 100, and 110; AS 46.06.080; 18 AAC § 60.005; and 200. • Reviews and approves solid waste processing and temporary storage facilities plan for handling and temporary storage of solid waste on Federal and state lands under AS 46.03.005, 010, and 020; and 18 AAC § 60.430. • Approves the siting of hazardous waste management facilities.
Alaska Department of Fish and Game (ADFG)	• Issues Fish Habitat Permits under AS 41.I4.84O and AS 41.I4.870 for activities within streams used by fish that agency determines could represent impediments to fish passage, or for travel in, excavation of, or culverting of anadromous fish streams.
Alaska Department of Natural Resources (ADNR)	• Issues a Material Sales Contract for mining and purchase of gravel from state lands under AS 38.05.850; and 11 AAC §§ 71.070 and .075. • Issues Rights-of-Way (ROW) and Land Use permits for use of state land, ice road construction on state land, and state freshwater bodies under AS 38.05.850. • Issues a Temporary Water Use and Water Rights permit under AS 46.15 for water use necessary for construction and operations.

Table B–1. Federal, State and local requirements, permits and approvals for oil and gas exploration, development and production activities

Regulatory agency	Permit/approval actions/requirements
	• Issues pipeline ROW leases for pipeline construction and operation across state lands under AS 38.35.020. • Issues a Cultural Resources Concurrence for developments that may affect historic or archaeological sites under the National Historic Preservation Act of 1966, as amended (16 USC §§ 470 et seq.), Alaska Historic Preservation Act (AS 41.35.010 through .240).
Alaska Oil and Gas Conservation Commission (AOGCC)	• Issues a Permit to Drill under 20 AAC § 25.05. • Issues approval for annular disposal of drilling waste (20 AAC § 25.080). • Authorizes Plugging, Abandonment, and Location Clearance (20 AAC § 25.105 through 25.172). • Authorizes Production Practices (20 AAC §§ 25.200 through 25.245). • Authorizes Class II Waste Disposal and Storage (20 § AAC 25.252). • Approves Workover Operations (20 § AAC 25.280). • Reports (20 AAC §§ 25.300 through 25.320). • Authorizes Enhanced Recovery Operations under 20 AAC §§ 25.402-460.
BOROUGH	
North Slope Borough (NSB)	• Issues Development Permits for oil and gas projects under NSB Code of Ordinance Title 19.

Appendix C:

NPR-A Climate Change Analysis: An Assessment of Climate Change Variables in the National Petroleum Reserve in Alaska

Appendix C: NPR-A Climate Change Analysis: An Assessment of Climate Change Variables in the National Petroleum Reserve in Alaska

Note: The following pages are reproduced from a separate report that was published in August 2011.

NPR-A Climate Change Analysis

An Assessment of Climate Change Variables in the National Petroleum Reserve in Alaska

Prepared for the

U.S. Department of the Interior
Bureau of Land Management
by the
Scenarios Network for Alaska & Arctic Planning (SNAP)
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UNIVERSITY OF ALASKA FAIRBANKS

Scenarios Network
FOR ALASKA & ARCTIC PLANNING

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

University of Alaska Geography Program
uagp

SNRAS
SCHOOL OF NATURAL RESOURCES & AGRICULTURAL SCIENCES

August 2011

Introduction

Alaska is undergoing rapid changes. Substantial warming has occurred at high northern latitudes over the last half-century. Fire patterns are changing, permafrost is thawing, and Arctic summers are now warmer than at any other time in the last 400 years. Most climate models predict that high latitudes will experience a much larger rise in temperature than the rest of the globe over the coming century. At the same time, the state is undergoing rapid changes in human population and demands on natural resources. These changes mean that maintaining the status quo in operations and management of resources and growth may result in increased costs, risk, and resource damage. Future planning that accounts for these changes can avoid or reduce these potential liabilities.

The Bureau of Land Management-Arctic Field Office is responsible for the management of the National Petroleum Reserve-Alaska (NPR-A). The BLM has undertaken an Integrated Activity Plan (IAP)/ Environmental Impact Statement (EIS) to determine its future management of the NPR-A. The IAP/EIS is considering the impacts of climate change in its plan. To improve the IAP/EIS's analysis of climate change's effects on the planning area and its resources, the BLM is incorporating climate change modeling specifically tailored for the NPR-A and areas on Alaska's North Slope that may seasonally be home for animals that could be affected by BLM-authorized activities in NPR-A.

For this project, the Scenarios Network for Alaska Planning (SNAP: www/snap.uaf.edu), a program within the University of Alaska Geography Program, provided objective scenarios based on climate projections and associated models of future landscape conditions that are helping to inform the EIS planning process described above. SNAP is a collaborative network that includes the University of Alaska, state, federal, and local agencies, NGO's, and industry partners. The SNAP network provides timely access to scenarios of future conditions in Alaska and other Arctic regions for more effective planning by communities, industry, and land managers. The network meets stakeholders' requests for specific information by applying new or existing research results, integrating and analyzing data, and communicating information and assumptions to stakeholders. SNAP's goal is to assist in informed decision-making.

The projections used in this project were for a range of modeled data, including baseline (1961-1990), current, and future years extending to 2099. These data provided measurements of change as they are likely to manifest themselves across NPR-A, differentiating the amount of change in different areas of the planning area, and estimating the uncertainty associated with each projection. SNAP provided data on the effects of climate change on the following environmental factors: temperature, precipitation, water availability, vegetation (including green-up rate), and fire regime. Measures of change were, where appropriate, specific to month and/or season. The full results of this assessment are presented below.

Modeling climate change

[For additional detail, see Appendix A: SNAP Climate Data and Modeling and Appendix B: Uncertainty as well as the SNAP website at www.snap.uaf.edu]

SNAP climate models

SNAP climate projections are based on downscaled regional Global Circulation Models (GCMs) from the Intergovernmental Panel on Climate Change (IPCC). The IPCC used fifteen different GCMs when preparing its Fourth Assessment Report released in 2007. SNAP collaborator Dr. John Walsh and colleagues analyzed how well each model predicted monthly mean values for three different climate variables over four overlapping northern regions for the period from 1958 to 2000.

For this project, SNAP used mean (composite) outputs from the five models that provided the most accurate overall results. For each of these five models, results relied on model runs based on midrange (A1B) predictions of greenhouse gas emissions, as defined by the IPCC. The A1B scenario was selected because it offers a balanced and somewhat conservative perspective on the future of human population growth, technology, and energy use; results from this scenario are unlikely to overstate the severity of projected change, given recent climate and emission trends. SNAP model outputs based on these GCMs cover the time period from 1980 to 2099.

Model downscaling

GCMs generally provide only large-scale output, with grid cells typically 1°-5° latitude and longitude. SNAP scaled down these outputs to 2 km resolution, using baseline climatology grids from PRISM (Parameter-elevation Regressions on Independent Slopes Model). These grids represented mean monthly values for precipitation and temperature for the years 1961-1990. PRISM uses point data, a digital elevation model, and other spatial data sets to generate gridded estimates of monthly, yearly, and event-based climatic parameters, such as precipitation, temperature, and dew point. PRISM was originally developed to address the lack of climate observations in mountainous regions or rural areas. SNAP calculated the differences between baseline PRISM grids and GCM grids for the same time period, and used the resulting anomaly grids to downscale future projections.

Model uncertainty

Greenhouse-driven climate change represents a response to the radiative forcing associated with increases of carbon dioxide, methane, water vapor and other gases, as well as associated changes in cloudiness. The response varies widely among GCMs because it is strongly modified by feedbacks involving clouds, the cryosphere, water vapor, and other processes whose effects are not well understood. The ability of a model to accurately replicate seasonal radiative forcing is a good test of its ability to predict changes in radiative forcing associated with increasing greenhouse gases. SNAP models have been assessed using backcasting and comparison to historical conditions, and have proven to be robust in predicting overall climate trends.

Model projections are presented as monthly average values. While trends are relatively clear, precise values for any one year or month for any single model cannot be considered reliable weather forecasts. Each model incorporates the same degree of variability found in normal weather patterns. The downscaling process introduces further uncertainty. While PRISM offers the best available algorithms for linking climate variability to weather station interpolation and digital elevation maps (DEMs), the connection is not perfect. Weather stations are sparse in Alaska, particularly in the northern part of the state, which tends to lower model reliability. Overall, model validation has shown that SNAP projections are more robust for temperature than for precipitation.

Some of this uncertainty can be dampened by using average values across time, space, and GCMs. All three kinds of averaging have been used in this analysis. Averaging increases the reliability of projections, but makes it impossible to make predictions about extreme events such as storms or floods. Since such events are likely to have less impact than more broad-based shifts in the NPR-A, an averaging approach was selected for this project. As described below, additional uncertainty is introduced when SNAP climate models are linked with additional parameters such as fire dynamics, vegetation shift, or permafrost thaw.

Selection of variables and data

For the purposes of this project, SNAP and the BLM analyzed three distinct regions within the NPR-A: the coastal plain, the foothills, and the mountains (Figure 1). It is expected that climate change will have distinct impacts on these different zones. The project focused on projections for two selected decades, 2040-2049 and 2090-2099, in order to provide shorter-term and long-term analysis of climate trends. For most variables, these future decades were compared to the standard baseline climatology used by SNAP, PRISM, and the IPCC: 1961-1990. Temperature and precipitation were assessed in terms of summer (May through September) and winter (October through April) averages for those decades. Additional variables were assessed based on appropriate time steps and seasons, as described in each section below. These variables were selected by the BLM in conjunction with SNAP scientists, and were analyzed by researchers at SNAP in collaboration with the UAF Geophysical Institute Permafrost Lab, the UAF Institute of Arctic Biology, and the UAF School of Natural Resources. They included water availability, fire regime, depth of active layer, potential biome/vegetation shift, and changes in dates of spring thaw and winter freeze. Modeling methods were different for each of these variables, and sources and magnitude of uncertainty vary. The results of each assessment are presented and discussed below.

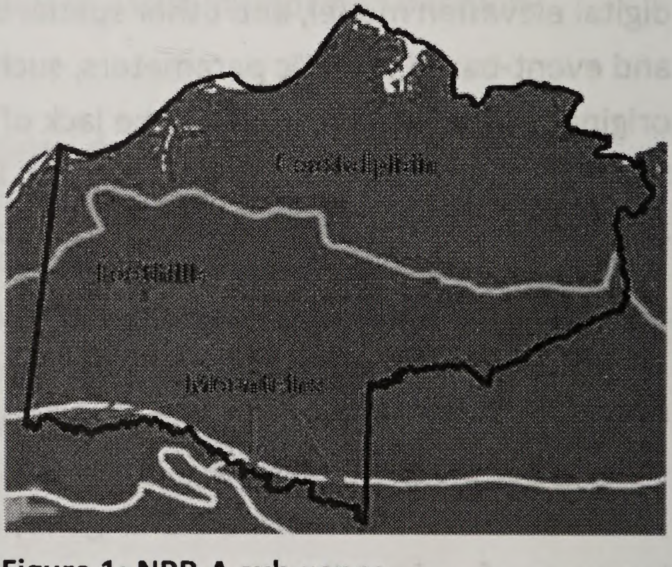

Figure 1: NPR-A sub-zones.

Projection Results for the NPR-A

Temperature

Table 1: Summer temperature projections by decade and region. "Summer" refers to averages for May through September.

SUMMER TEMPERATURE (°F)	1961-1990	2040-2049	2090-2099
NPRA (all)	40.10	43.10	45.87
Coastal Plain	38.22	41.08	43.72
Foothills	41.71	44.82	47.70
Mountains	42.02	45.26	48.27
	Change from 1961-1990 (°F)		
NPRA (all)	X	3.00	5.77
Coastal Plain	X	2.86	5.50
Foothills	X	3.11	5.99
Mountains	X	3.24	6.25

Table 2: Winter temperature projections by decade and region. "Winter" refers to averages for October through April.

WINTER TEMPERATURE (°F)	1961-1990	2040-2049	2090-2099
NPRA (all)	-9.62	1.24	8.84
Coastal Plain	-9.68	1.34	9.21
Foothills	-9.76	0.98	8.35
Mountains	-6.09	4.40	11.38
Change from 1961-1990 (°F)			
NPRA (all)	X	10.86	18.46
Coastal Plain	X	11.02	18.89
Foothills	X	10.74	18.11
Mountains	X	10.49	17.47

Both summer and winter temperatures are expected to increase across the NPR-A throughout the century, with the greatest increases in winter. Summer temperatures are projected to rise across the NPR-A by approximately 3°F by the 2040s, and by approximately 5-6°F by the 2090s (Table 1). Average winter temperatures (October to April) are likely to increase by as much as 18°F by the 2090s, rising well above zero Fahrenheit, as compared to historical averages of almost ten below (Table 2). Historically, summer temperatures in the NPR-A show a north-south gradient, with the coolest temperatures on the coast and the warmest in the mountains (Figure 2). Winter temperatures show a more complex spatial pattern (Figure 3). For winter temperatures, the increase is projected to be greatest in the coastal plain and least in the mountains. While the opposite pattern is predicted in the summer. As can be seen in Figure 2, summer temperatures characteristic of the southernmost portions of the NPR-A are likely to be seen across the majority of the region by

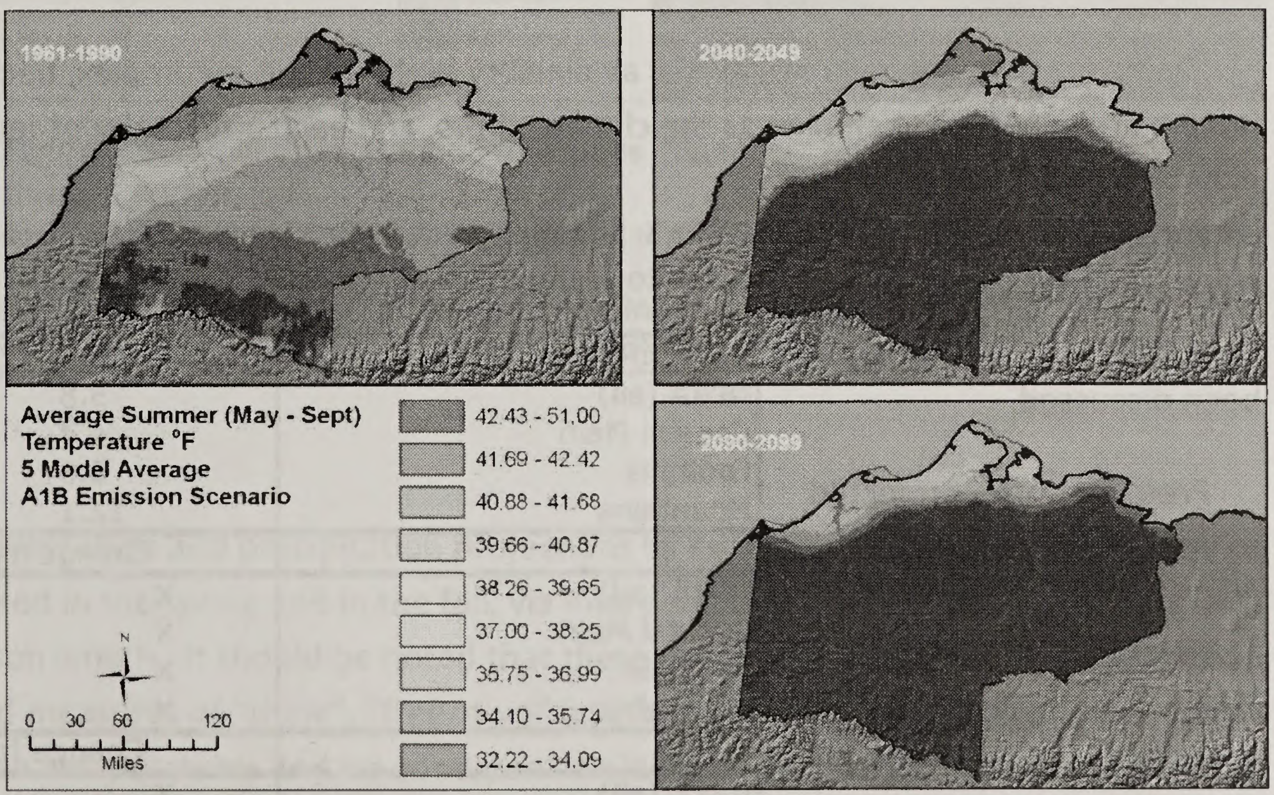

Figure 2: Summer Temperature Projections. "Summer" refers to averages for May through September.

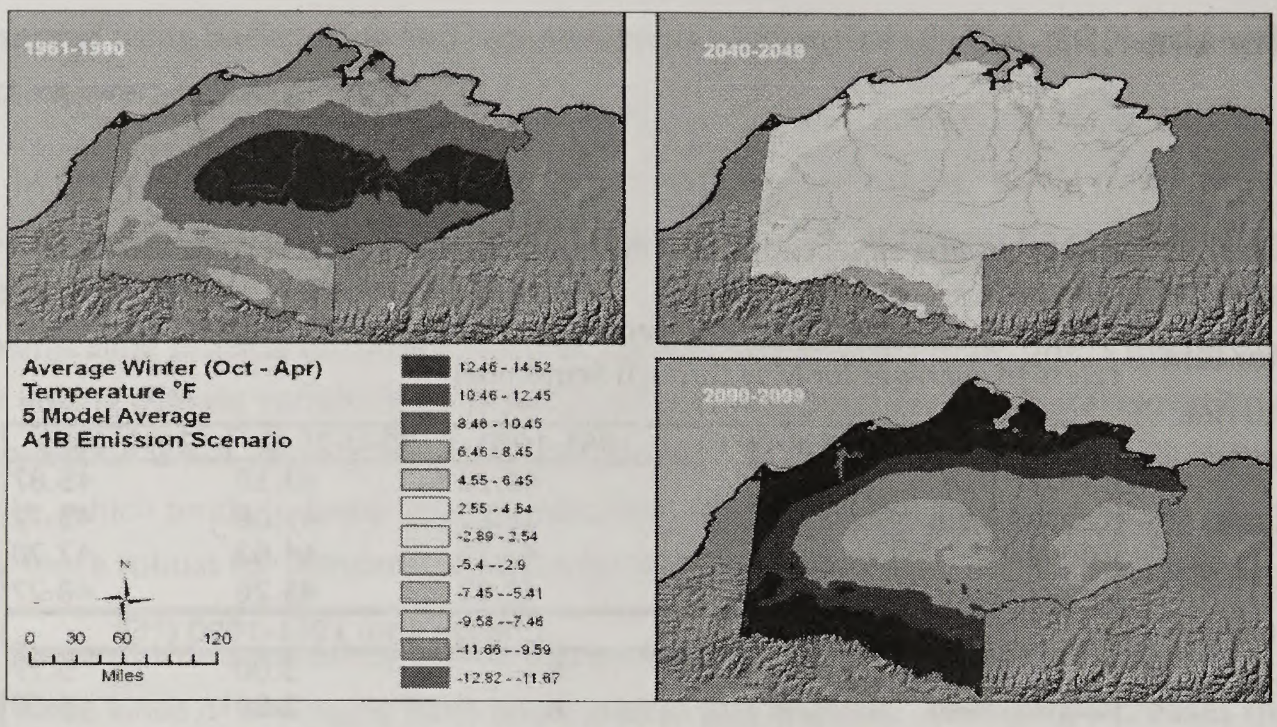

Figure 3: Winter Temperature Projections. "Winter" refers to averages for October through April.

the end of the century, with cooler temperatures persisting only on the coast. Winter temperatures show a more extreme pattern of change. By mid-century, SNAP models predict that even the coldest areas of the NPR-A are likely to experience warmer winters than the warmest areas of the region experienced historically. By the end of the century, unprecedented warm mean winter temperatures are projected throughout the area.

Precipitation

The NPR-A, like the rest of Alaska's Arctic, is a dry region, with historical summer precipitation at less than six inches, and winter precipitation (rain equivalent) at less than five inches. Despite it being essentially a desert, a great number of lakes and wetlands persist in the Arctic due to several factors, including flat topography (on the coastal plain); limited drainage caused by shallow permafrost; and limited evapotranspiration, due to cool temperatures and low biomass.

Predicting changes in overall water availability in the NPR-A is complex, because many of the above factors are expected to change as the climate shifts, and each affects the others, sometimes in unpredictable ways. Thus, water balance will be discussed in the final section of this report, after each of these topics has been discussed.

Table 3: Summer precipitation projections by decade and region. "Summer" refers to averages for May through September.

SUMMER PRECIPITATION (in.)	1961-1990	2040-2049	2090-2099
NPRA (all)	5.8	7.0	7.4
Coastal Plain	4.4	5.5	5.9
Foothills	6.8	8.0	8.4
Mountains	12.1	13.4	13.8
	Change from 1961-1990 (in.)		
NPRA (all)	X	1.1	1.5
Coastal Plain	X	1.2	1.5
Foothills	X	1.2	1.6
Mountains	X	1.3	1.7
	Change from 1961-1990 (%)		
NPRA (all)	X	+19.4	+26.2
Coastal Plain	X	+26.2	+33.5
Foothills	X	+17.5	+23.4
Mountains	X	+10.8	+13.9

Precipitation is projected to increase in both summer (Table 3) and winter (Table 4) across all regions of the NPR-A. Greater increases are expected in winter precipitation than in summer precipitation, with increases of 20-45% projected by the 2040s, and 35-70% by the 2090s. However, it should be noted that the uncertainty of precipitation forecasts is generally greater than that of temperature predictions (Walsh et al.2008).

Warmer winter temperatures may result in some of this winter precipitation occurring as rain during the shoulder seasons. Precipitation is not divided into rainfall and snowfall, but is reported uniformly as rain-water equivalent.

Table 4: Winter precipitation projections by decade and region. "Winter" refers to averages for October through April.

WINTER PRECIPITATION (in.)	1961-1990	2040-2049	2090-2099
NPRA (all)	4.6	6.2	7.3
Coastal Plain	3.6	5.3	6.3
Foothills	5.3	6.9	8.0
Mountains	7.9	9.5	10.8
	Change from 1961-1990 (in.)		
NPRA (all)	X	1.6	2.7
Coastal Plain	X	1.6	2.7
Foothills	X	1.6	2.7
Mountains	X	1.6	2.8
	Change from 1961-1990 (%)		
NPRA (all)	X	+35.2	+58.3
Coastal Plain	X	+45.3	+73.2
Foothills	X	+29.9	+50.8
Mountains	X	+20.3	+35.7

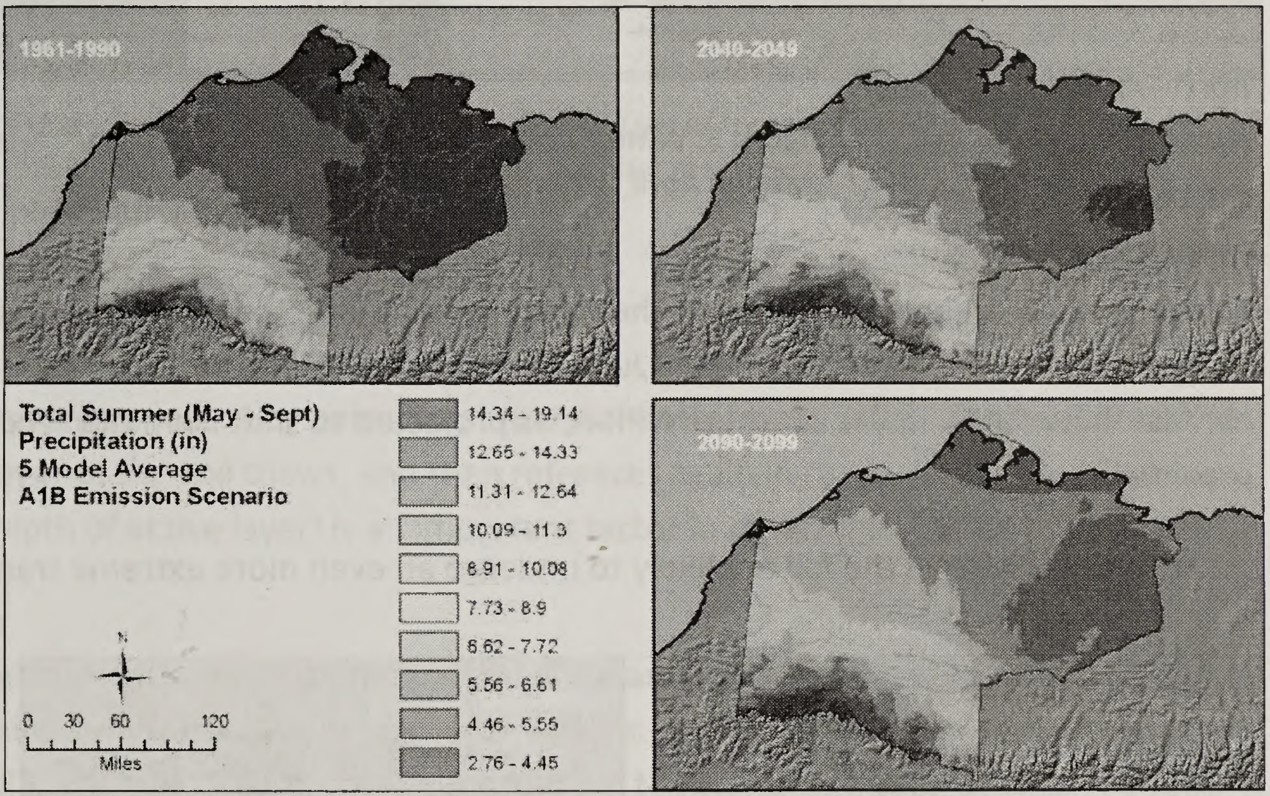

Figure 4: Summer Precipitation Projections. "Summer" refers to averages for May through September.

SNAP models predict the greatest percentage increases in precipitation in the coastal plain, which historically has less than half the annual precipitation of the mountains. However, even a seemingly large increase (33% in summer and 73% in winter) amounts to only an additional 1.5 inches of summer rainfall and 2.7 inches of winter rain-equivalent. In general, the north-south precipitation gradient seen in the NPR-A is expected to remain, as seen in Figures 4 and 5.

Freeze and thaw dates

SNAP uses monthly temperature and precipitation projections to estimate the dates at which the freezing point will be crossed in the spring and in the fall, via interpolation. The intervening time period is defined as summer season length. It should be noted that these dates do not necessarily correspond with other commonly used measures of "thaw", "freeze-up" and "growing season." Some lag time is to be expected between mean temperatures and ice conditions on lakes or in soils. However, analyzing projected changes in these measures over time can serve as a useful proxy for other season-length metrics.

Because of the buffering effect of the Arctic Ocean, the NPR-A experiences the warmest spring temperatures in the south, but the warmest fall temperatures in the north.

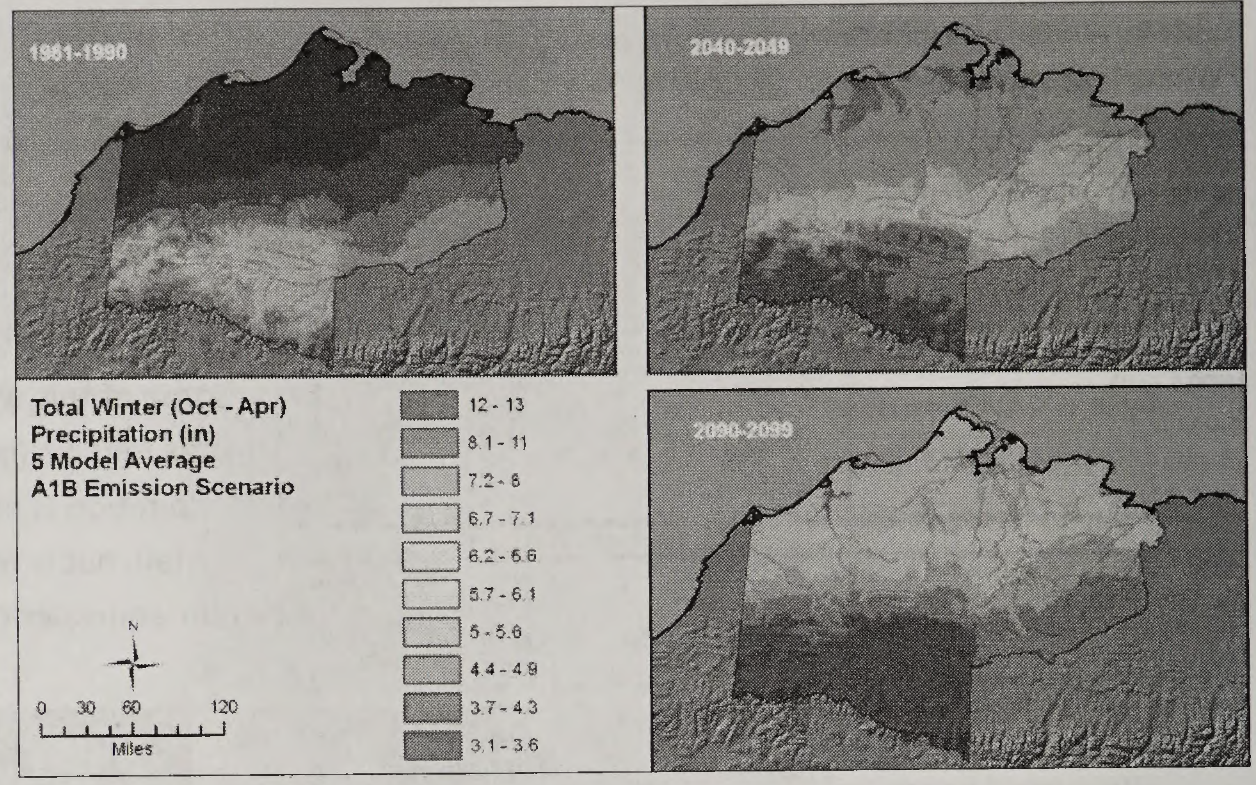
1961-1990
2040-2049
2090-2099
Total Winter (Oct - Apr)
Precipitation (in)
5 Model Average
A1B Emission Scenario
12 - 13
8.1 - 11
7.2 - 8
6.7 - 7.1
6.2 - 6.6
5.7 - 6.1
5 - 5.6
4.4 - 4.9
3.7 - 4.3
3.1 - 3.6
N
0 30 60 120
Miles

Figure 5: Winter Precipitation Projections. "Winter" refers to averages for October through April

Figure 6 shows projected changes in thaw dates for the baseline period as well as for the 2040s and 2090s. A northward shift in thaw dates is expected over the course of the century. Historically, the coldest coastal regions did not cross the freezing point until the second week of June; these areas are projected to thaw in the first week of June by mid-century, and as early as June 1 by late century. The earliest thaw dates, in the southern NPR-A, as projected to shift from the second week of May to approximately May 1st.

Freeze-up dates in the fall are likely to undergo an even more extreme transition (Figure 7). Historically, the entire NPR-A passed the freezing point in mid-September. By the 2040s, SNAP models show the coastal areas not freezing until early October, and southern regions freezing in late September. By the end of the century, even the mountainous areas may not freeze until October 1st, and the ocean-moderated coastline may be above freezing until the end of October.

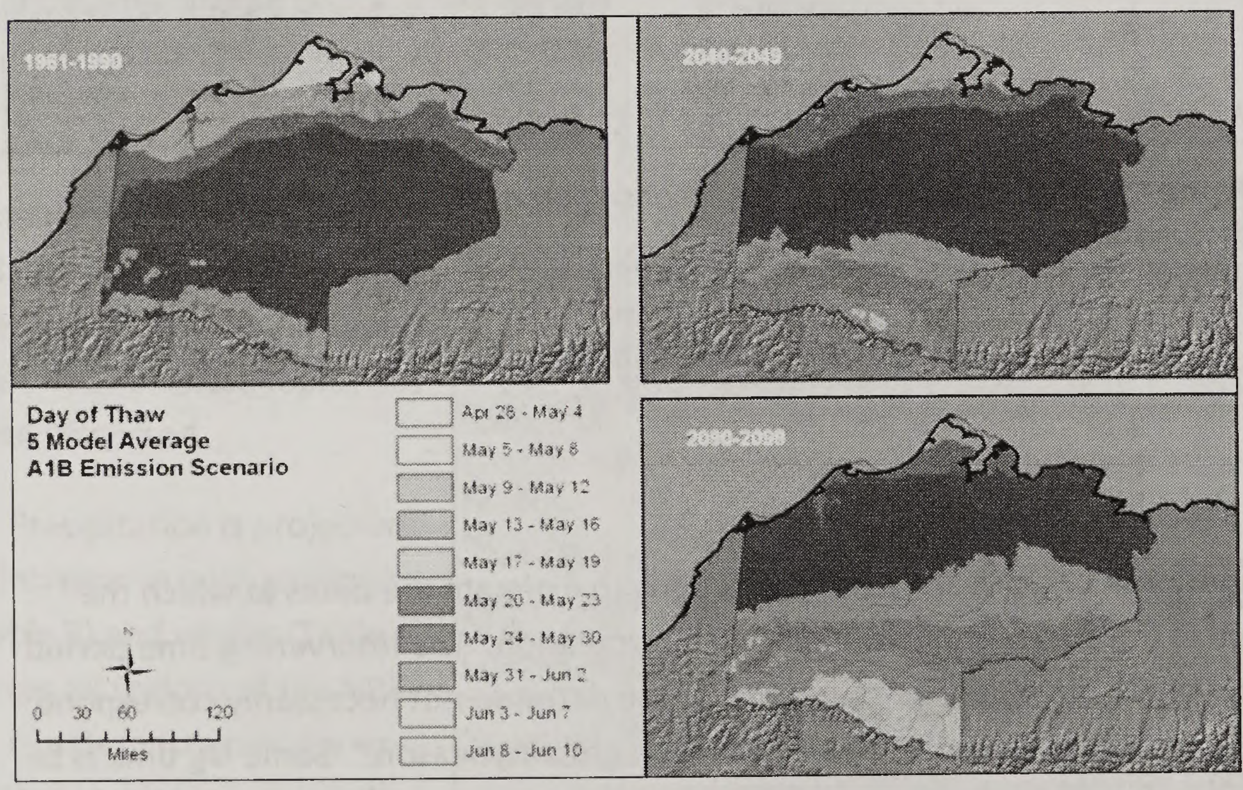
1961-1990
2040-2049
2090-2099
Day of Thaw
5 Model Average
A1B Emission Scenario
Apr 28 - May 4
May 5 - May 8
May 9 - May 12
May 13 - May 16
May 17 - May 19
May 20 - May 23
May 24 - May 30
May 31 - Jun 2
Jun 3 - Jun 7
Jun 8 - Jun 10
N
0 30 60 120
Miles

Figure 6: Spring thaw projections. Thaw is defined, for the purposes of this analysis, as the day at which the running mean temperature crossed the freezing point of fresh water.

Since sea ice forms at temperatures well below the freezing point of fresh water, ice formation would be expected later still.

Overall, changes in spring and fall temperatures translate into a summer season that is up to six weeks longer in the northern NPR-A, and approximately three weeks longer in the southern NPR-A.

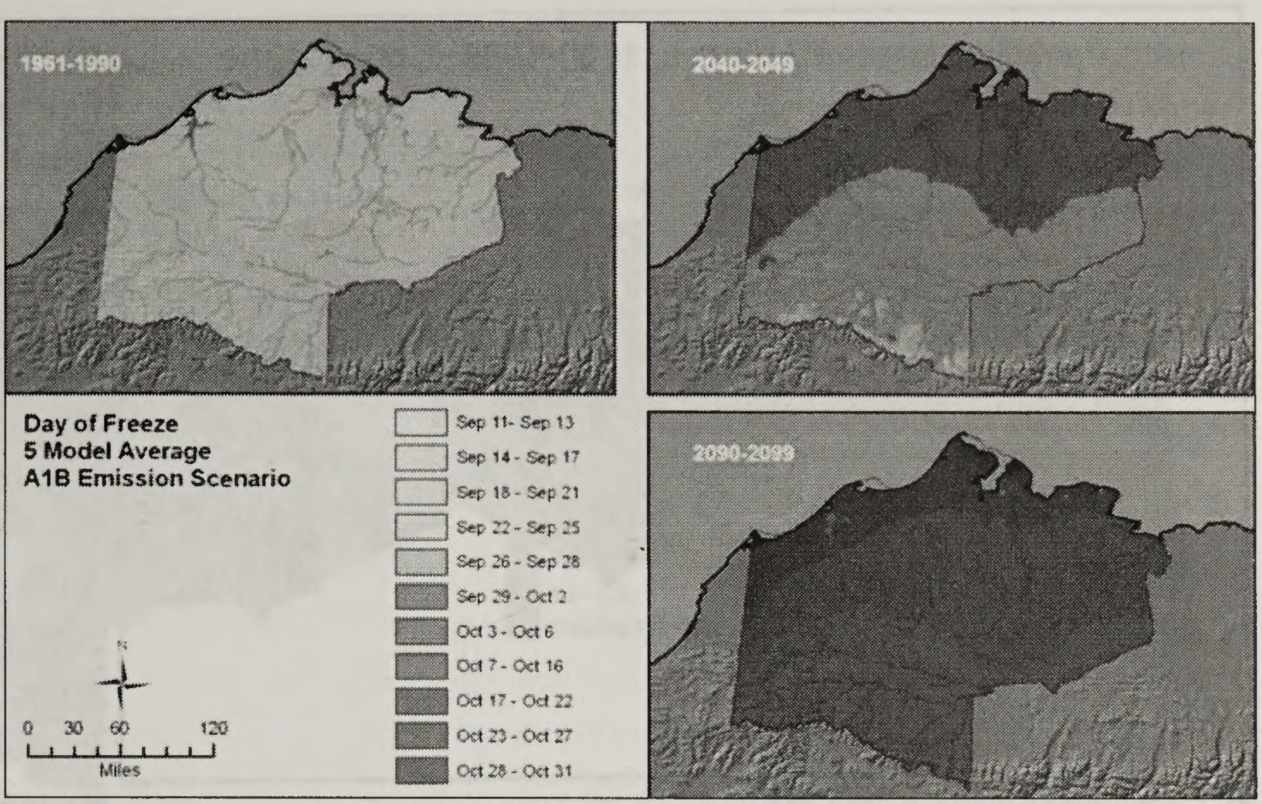

Figure 7: Autumn freeze-up projections. Day of freeze is defined, for the purposes of this analysis, as the day at which the running mean temperature crossed the freezing point of fresh water.

Permafrost and depth of active layer

All of the NPR-A is currently underlain by permafrost (permanently frozen soils). During the summer season, the surface layer of the soil thaws, and then refreezes again in the autumn. The depth to which this thaw occurs (depth of active layer) is an important factor in determining what plant species can thrive here.

Permafrost presence/absence, depth to permafrost, and the annual depth of the active layer play important roles in determining ecosystem structure and function. Loss of permafrost stability will impact soil drainage and surface heat flux, while changes in annual thaw depths are likely to affect not only runoff and drainage but also the timing and depth to which plants can access soil moisture. Permafrost vulnerability to climate change is affected by not only mean annual temperature, but also topography, water, soil, vegetation, and snow. Jorgenson et al (2010) found that surface water, ground water, and snow depth had large effects on permafrost stability, and that vegetation succession provides strong negative feedbacks that make permafrost resilient to even large increases in air temperatures. Permafrost creates a strong heat

Table 5: Mean annual thickness of active layer, in meters. Permafrost modeling was performed by Sergei Marchenko of the UAF Geophysical Institute permafrost Lab. Future time periods are modeled using permafrot models coupled with SNAP climate data.

time period	entire NPR-A	coastal	foothill	mountain
1980s	0.493	0.380	0.589	0.704
1990s	0.525	0.406	0.625	0.742
2000s	0.544	0.422	0.648	0.768
1980s-2000s	0.521	0.403	0.621	0.738
2040s	0.590	0.453	0.705	0.854
2090s	0.695	0.553	0.810	1.035
% change from 1980s-2000s				
2040s	13.3	12.4	13.6	15.8
2090s	33.5	37.2	30.5	40.2

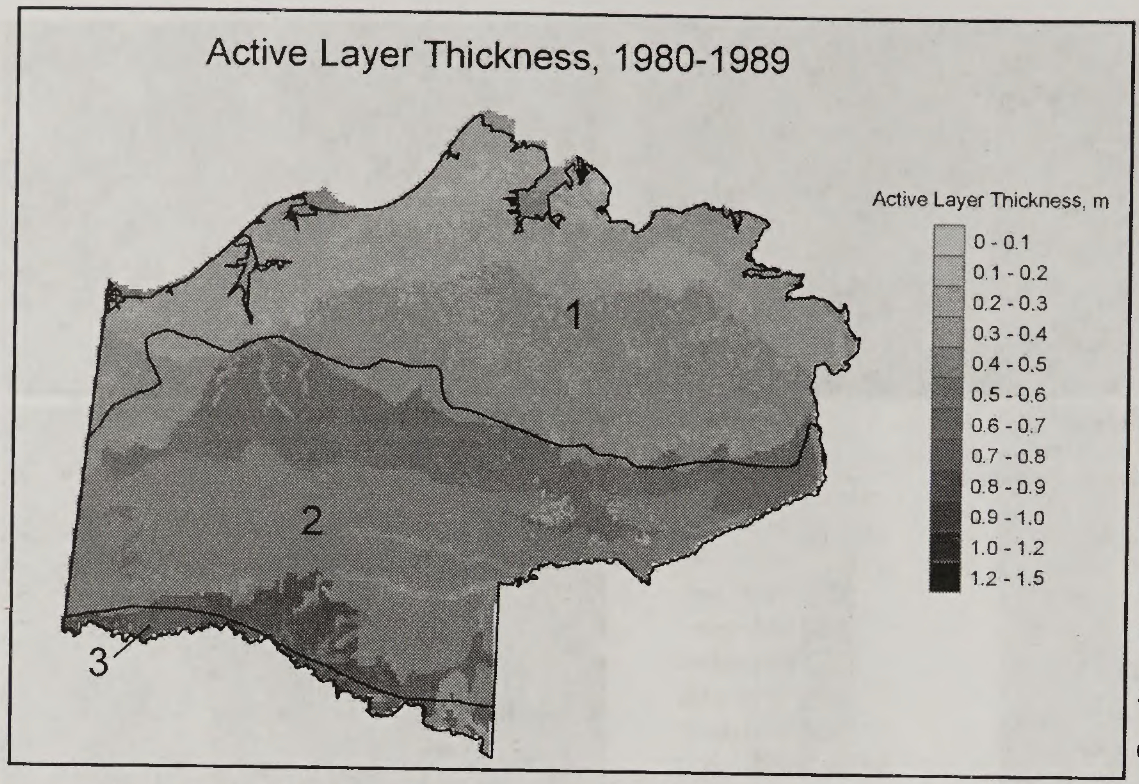
Active Layer Thickness, 1980-1989
Active Layer Thickness, m
0 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1.0
1.0 - 1.2
1.2 - 1.5
1
2
3

Figure 8 – Historic estimates of depth of active layer, 1980-1989. Active layer represents maximum thaw depths at the end of the summer season, and affects hydrology and vegetation. Region 1 is the Coastal Plains, Region 2 is the Foothills, and Region 3 is the Mountains.

sink in summer that reduces surface temperature and therefore heat flux to the atmosphere (Yoshikawa et al., 2003).

This portion of the project was undertaken by Dr. Sergei Marchenko, and used permafrost models developed by Dr. Vladimir E. Romanovsky and his colleagues at the Geophysical Institute Permafrost Lab (GIPL) at UAF. GIPL used complex models and extensive monitoring stations and field measurements to address scientific questions related to circumpolar permafrost dynamics and feedbacks between permafrost and global climate change. Their models take into account the insulation properties of various soil types and ground covers in order to estimate the lag time between air temperature change and permafrost change. For these projections, GIPL models were linked with SNAP climate projections to produce projections for the 2040s and the 2090s, as compared to the time period between 1980 and 1999.

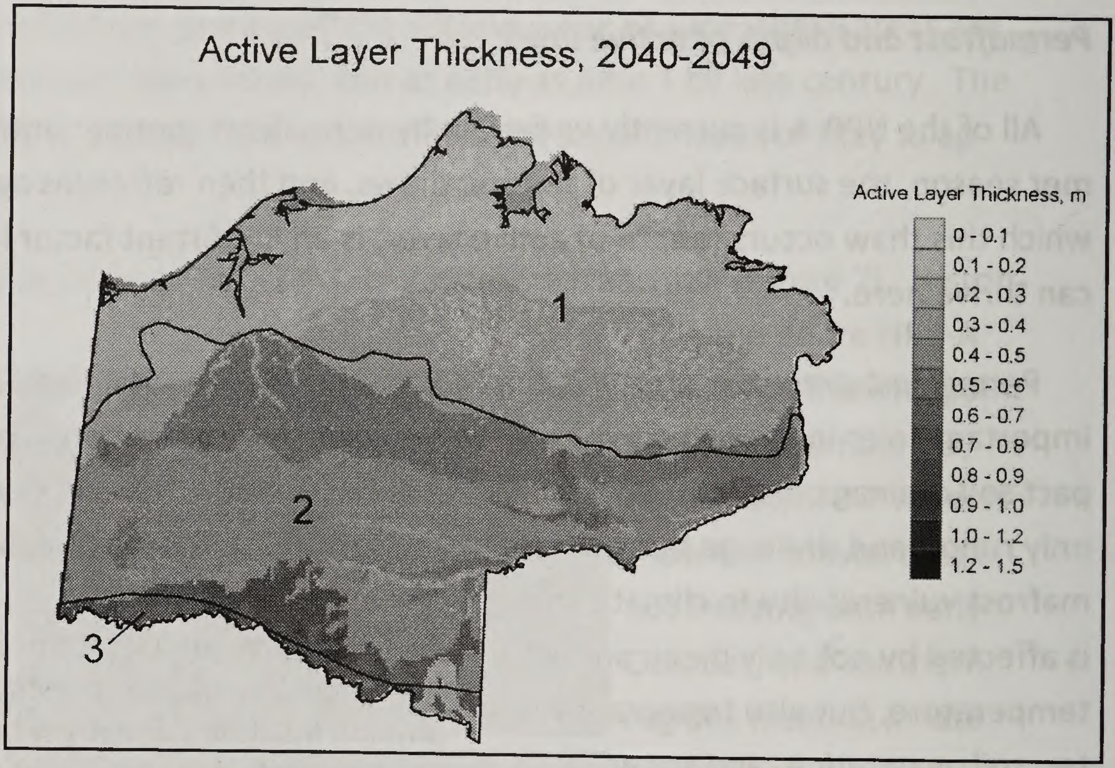
Active Layer Thickness, 2040-2049
Active Layer Thickness, m
0 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1.0
1.0 - 1.2
1.2 - 1.5
1
2
3

Figure 9 –Projections for depth of active layer, 2040-2049. Modest increases in summer thaw depths are projected by the middle of this century. Such changes may trigger shifts in hydrology and vegetation. Region 1 is the Coastal Plains, Region 2 is the Foothills, and Region 3 is the Mountains.

Results show increases in the depth of the active layer across all regions of the NPR-A, with an overall mean increase of about 30-40% by the end of this century, as compared to the latter part of the previous century (Table 5). As can be seen in Figure 8, historic active layer thickness shows a complex spatial pattern across the NPR-A, with values ranging from only approximately 10 centimeters to as much as a meter and a half. The areas with the greatest active layer thickness are generally in the mountains.

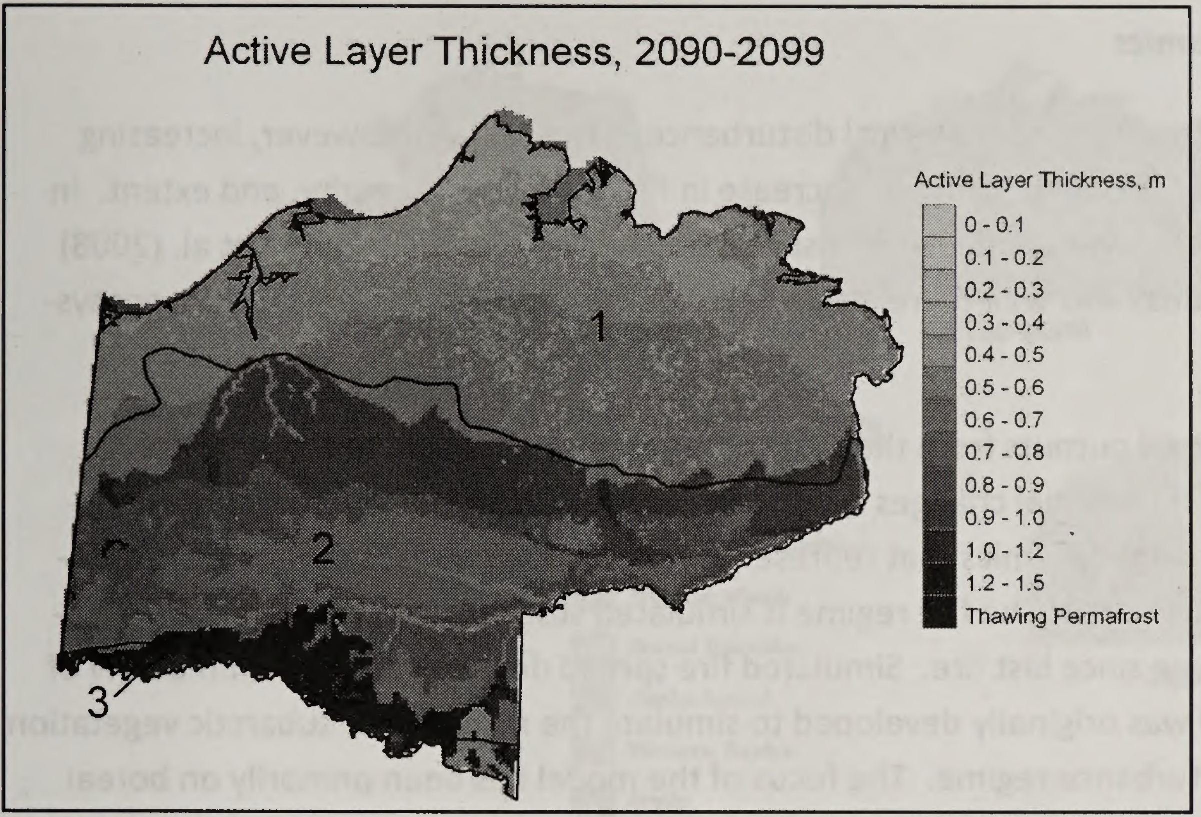
Active Layer Thickness, 2090-2099
Active Layer Thickness, m
0 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1.0
1.0 - 1.2
1.2 - 1.5
Thawing Permafrost
1
2
3

Figure 10 –Projections for depth of active layer, 2090-2099. In some mountainous regions of the NPR-A, loss of shallow permafrost is possible by the end of the century. Region 1 is the Coastal Plains, Region 2 is the Foothills, and Region 3 is the Mountains.

Future projections for the middle of this century show modest but significant increases in active layer depth, with overall spatial patterns remaining the same (Figure 9). By the 2090s (Figure 10), summer thaw depths may increase more dramatically, and in some mountainous areas, shallow permafrost may thaw entirely.

As previously noted, changes in active layer depth and permafrost thaw can have profound effects on vegetation. Where permafrost is very shallow, soils tend to remain saturated throughout the growing season unless on slopes, and only shallow-rooted plants can persist. Conversely, deeper thawed soils allow for better drainage and the growth of woody plants species. The loss of permafrost can lead to thermokarst, slumping, and other major changes in hydrology and land morphology. While the area in which total near-surface permafrost loss is projected is relatively small (shown in red in Figure 9) these regions might be expected to undergo more extreme changes, such as thermokarst and slumping, as compared to other parts of the NPR-A.

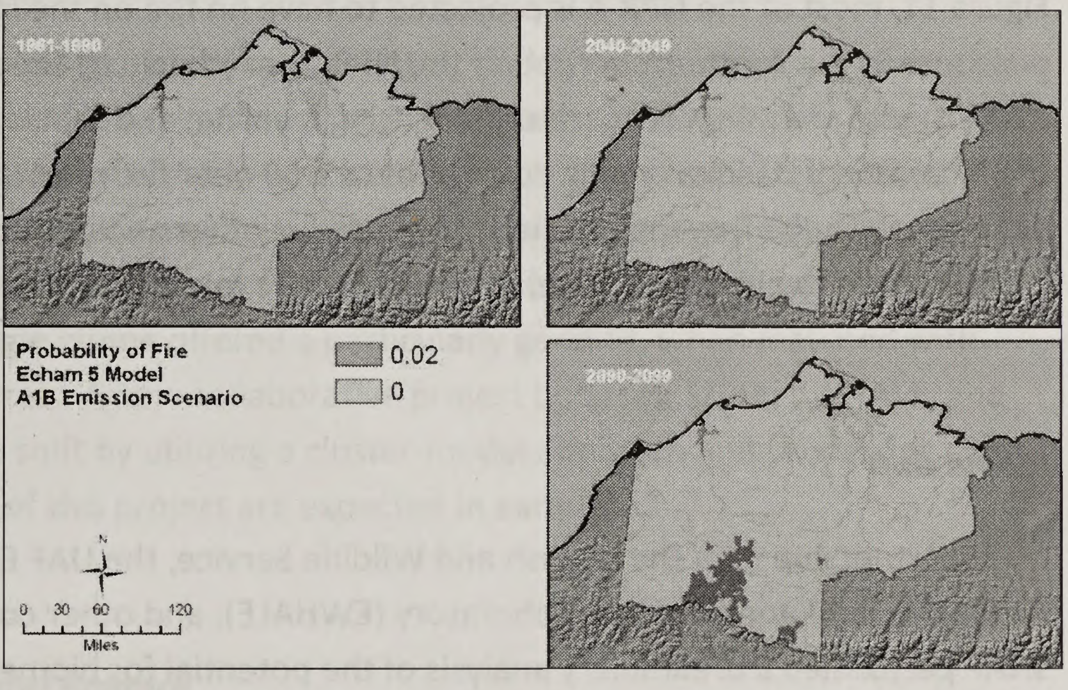
1961-1990
2040-2049
2090-2099
Probability of Fire
Echam 5 Model
A1B Emission Scenario
0.02
0
N
0 30 60 120
Miles

Figure 11 – Probability of fire, per year, based on the ALFRESCO spatially explicit fire model.

Effects on permafrost thaw on vegetation are expected to be complex, since vegetation strongly affects the insulation of soils. In some cases, a shift to denser and woodier plant canopies and thicker organic soils may offset the effects of warmer air temperatures, thus slowing permafrost thawing . On the other hand, positive feedbacks between summer warming, increased vegetation, decreased snow cover, and decreased ice extent may reduce albedo and exacerbate permafrost thaw.

Climate change and fire dynamics

Fire is not currently a major source of ecological disturbance in the NPR-A. However, increasing temperatures statewide are projected to cause an increase in fire frequency, severity, and extent. In the tundra, fire has historically played a small role in successional dynamics but Higuera et al. (2008) found that increased shrubbiness was well-correlated with increased fire frequency in tundra ecosystems across the paleorecord.

For this project, we examined outputs from the Alaska Frame-based Ecosystem Code model (ALFRESCO) in order to analyze potential changes in climate-induced fire patterns in the NPR-A. ALFRESCO is a model of successional dynamics that represents the spatial processes of fire and vegetation recruitment across the landscape. The fire regime is simulated stochastically and is driven by climate, vegetation type, and time since last fire. Simulated fire spread depends on the flammability of the adjacent pixel. ALFRESCO was originally developed to simulate the response of subarctic vegetation to a changing climate and disturbance regime. The focus of the model has been primarily on boreal vegetation, and results have indicated that in Interior Alaska, fire frequency changes strongly influence landscape-level vegetation patterns and associated feedbacks to future fire regime.

In the arctic, changes over the course of this century are expected to be more subtle. As seen in Figure 11, most of the NPR-A is projected to have no fire on the landscape. However, some mountainous areas in the southern portion of the NPR-A may begin to experience regular fire return intervals by 2100, due to warming temperatures, shifting treeline, and the drying effects of increased PET. A probability of fire of 0.02 is roughly equivalent to a 50-year fire return interval. Note that this modeling was done not with the five-model ensemble used for other analyses, but with a single model, ECHAM5. ECHAM5 was the highest ranked model in SNAP's model selection process.

Biome shift

In partnership with the US Fish and Wildlife Service, the UAF Ecological Wildlife Habitat Data Analysis for the Land and Seascape Laboratory (EWHALE), and other collaborators from around the state, SNAP performed a preliminary analysis of the potential for biome shift statewide, based on changing climate parameters. The project modeled projected shifts in broadly categorized species assemblages (biomes) based on existing land cover, current climatic conditions, and projected climate change. The Alaska biomes used in this project -- Arctic, Western Tundra, Alaska Boreal, Boreal Transition, North Pacific Maritime, and Aleutian Islands (Figure 12) -- were adapted from the unified ecoregions of Alaska. Random Forests™ was used to model projected spatial shifts in potential biomes, based on SNAP projections for mean temperature and precipitation for June and December for the decades 2000–2009, 2030–2039, 2060–2069, and 2090–2099.

It should be noted that "potential biomes" (species assemblages that might be expected to occur based on linkages with prevailing climate conditions) are not the same as actual biomes. Even if one assumes that biomes are primarily climate-driven, substantial lag times would be expected, to account

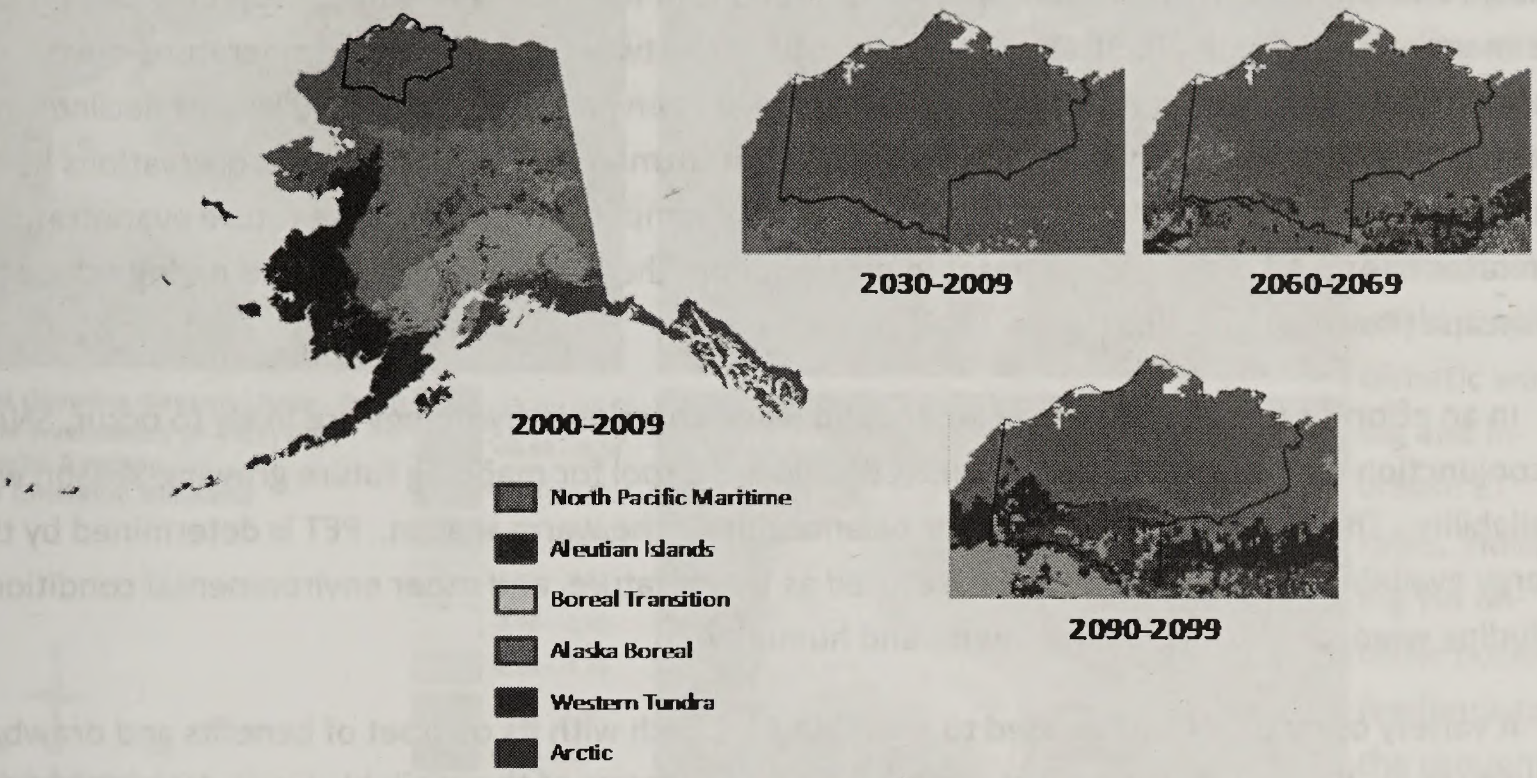

Figure 12: Historic biomes of Alaska and potential biome shift in the NPR-A. Most of the NPR-A is expected to stay within the range of temperature and precipitation (climate envelope) typical of the most recent decade. However, by the end of the century, climate projections for the southern NPR-A better match the climate currently found in other regions of the state, particularly more southerly mountain ranges.

for climate-driven factors such as soil changes, hydrologic changes, and permafrost thaw, and mechanistic factors such as seed dispersal and wildlife reproduction and migration. Nevertheless, results from this project provide a useful indicator of areas in which a mismatch can be expected between existing biome and future conditions. Such areas may be most highly subject to stress, disturbance, and species loss.The mottled pattern of predicted biomes seen in the projections for the southern NPR-A for the 2090s may indicate that no single biome offered a particularly good fit, when matched with projected climate conditions for this area. A new collaborative project between SNAP, EWHALE, and USFWS may shed more light on biome shift by utilizing a cluster-model approach and processing a larger number of variables. Final results of this project are expected in early 2012.

Potential Evapotranspiration and Water Balance

During the growing season, when biological demand is highest, evapotranspiration (ET) becomes the driving mechanism of landscape water loss. The term potential evapotranspiration (PET) is used to describe the likely amount of water that could be returned to the atmosphere through the combination of evaporation and transpiration.

In much of the boreal and arctic, PET during growing season months typically exceeds incoming precipitation, resulting in an overall water deficit during this time (Woo et al. 1992). As the climate continues to warm and the growing season gets longer, scientists expect PET and precipitation (P) will both increase. If the increase in water lost from the landscape through PET is not offset by an equivalent increase in incoming P, the NPR-A may experience more severe water-deficits during the growing season. This prediction is corroborated by observations of increased growing season ET based on satellite imagery (Zhang et al 2009). Over the latter half of the twentieth century, temperature-driven increases in summer evapotranspiration appear to have been partially responsible for net declines in summer water availability in arctic and boreal areas (Hinzman et al. 2005). These observations have led to hypotheses that continued increases in average temperatures may cause future evapotranspiration rates to exceed predicted increases in precipitation, thereby exerting increased drying across the landscape (Rouse et al. 1992; Rouse 2000).

In an effort to better understand where and when changes in hydrology are likely to occur, SNAP, in conjunction with the Wilderness Society, developed a tool for mapping future growing-season water availability. This model focused on water balance during the warm season. PET is determined by the energy available to evaporate water, measured as temperature, and other environmental conditions including wind, cloudiness, plant growth, and humidity.

A variety of methods can be used to estimate PET, each with its own set of benefits and drawbacks (Shutov et al. 2006). For this project, we were limited in terms of the available input data, and had to rely primarily upon estimates of future mean monthly temperature. We used the Preistley-Taylor model, which is described in detail in Appendix C.

Results from this model show that the existing negative water balance during the growing season across the Arctic is expected to persist in coming decades (Table 6) with PET values greater than P values for all regions other than the mountains (Figure 13). In the early part of the century, PET is expected to remain relatively constant (Figure 14). This can be explained by the way in which longwave radiation (reflected heat) is calculated. Longwave radiation is a function of temperature, but the relationship isn't linear. As temperatures increase from 32°F to about 45°F, outgoing longwave radiation increases, but at temperatures above 45°F, outgoing longwave radiation decreases. Thus, landscape drying would be expected to accelerate above this threshold.

Table 6: The projected balance between precipitation (P) and potential evapotranspiration (PET) in the NPR-A. Early in the century, increases in P may offset increased in PET driven by higher temperatures. However, this trend may reverse mid-century. Note that linked factors such as shifting biome and permafrost thaw may exacerbate drying.

Time period	Mean growing season P	Mean growing season PET	Growing season P-PET
1961-1990	5.66	11.73	-6.07
2040-2049	6.40	11.65	-5.25
2090-2099	6.82	12.11	-5.29

The relationship between temperature-driven increases in PET and projected increases in P is likely to hang in the balance. Hydrologic change driven by increases in either P or PET are expected to be relatively subtle, as compared to change driven by factors external to Preistley-Taylor model, including changes in growing season length; permafrost, active layer depth, and associated soil drainage; fire and post-fire succession; and ecosystem shifts. Each of these factors triggers complex feedback loops.

An increase in the depth to permafrost could result in greater runoff and precipitation infiltration,

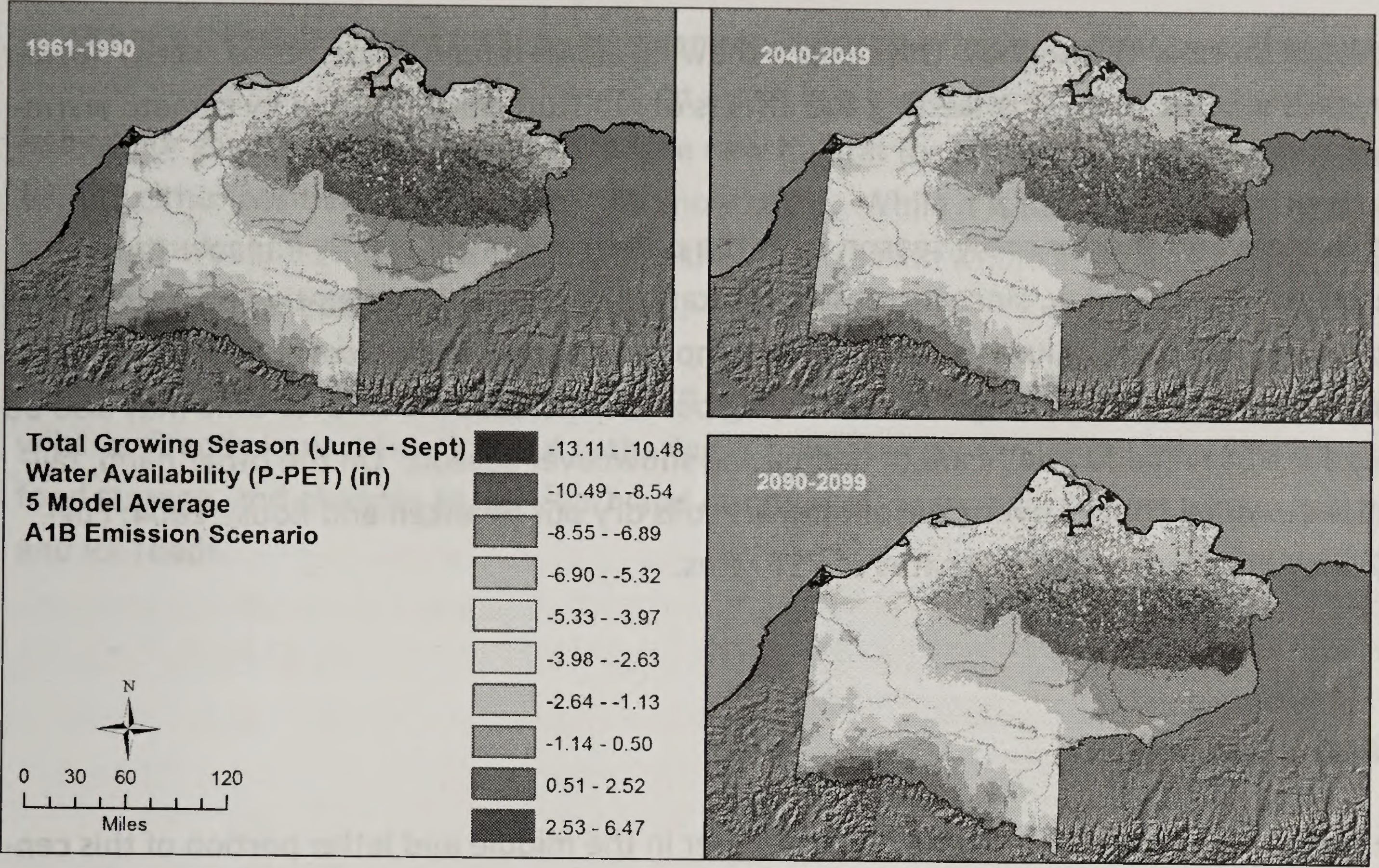
1961-1990
2040-2049
2090-2099
Total Growing Season (June - Sept)
Water Availability (P-PET) (in)
5 Model Average
A1B Emission Scenario
-13.11 - -10.48
-10.49 - -8.54
-8.55 - -6.89
-6.90 - -5.32
-5.33 - -3.97
-3.98 - -2.63
-2.64 - -1.13
-1.14 - 0.50
0.51 - 2.52
2.53 - 6.47
N
0 30 60 120
Miles

Figure 13: Predicted difference between Precipitation (P) and Potential Evapotranspiration (PET) during the growing season. P-PET is expected to remain negative throughout the century for much of the NPR-A, with the exception of the mountains to the south.

resulting in a decline in the surface water balance. Future losses of permafrost could amplify climatic warming and increase ET rates, indicating yet another positive feedback to the drought cycle.

Conversely, there is also suggestion that long-term melting of permafrost could increase water availability by converting water stored in frozen soils to freely available soil moisture. Rouss et al. (1992) found a feedback loop between dry conditions and depth of active layer in wetland tundra. Dry years promoted deeper thaw depths in permafrost soils during the growing season due to larger ground heat

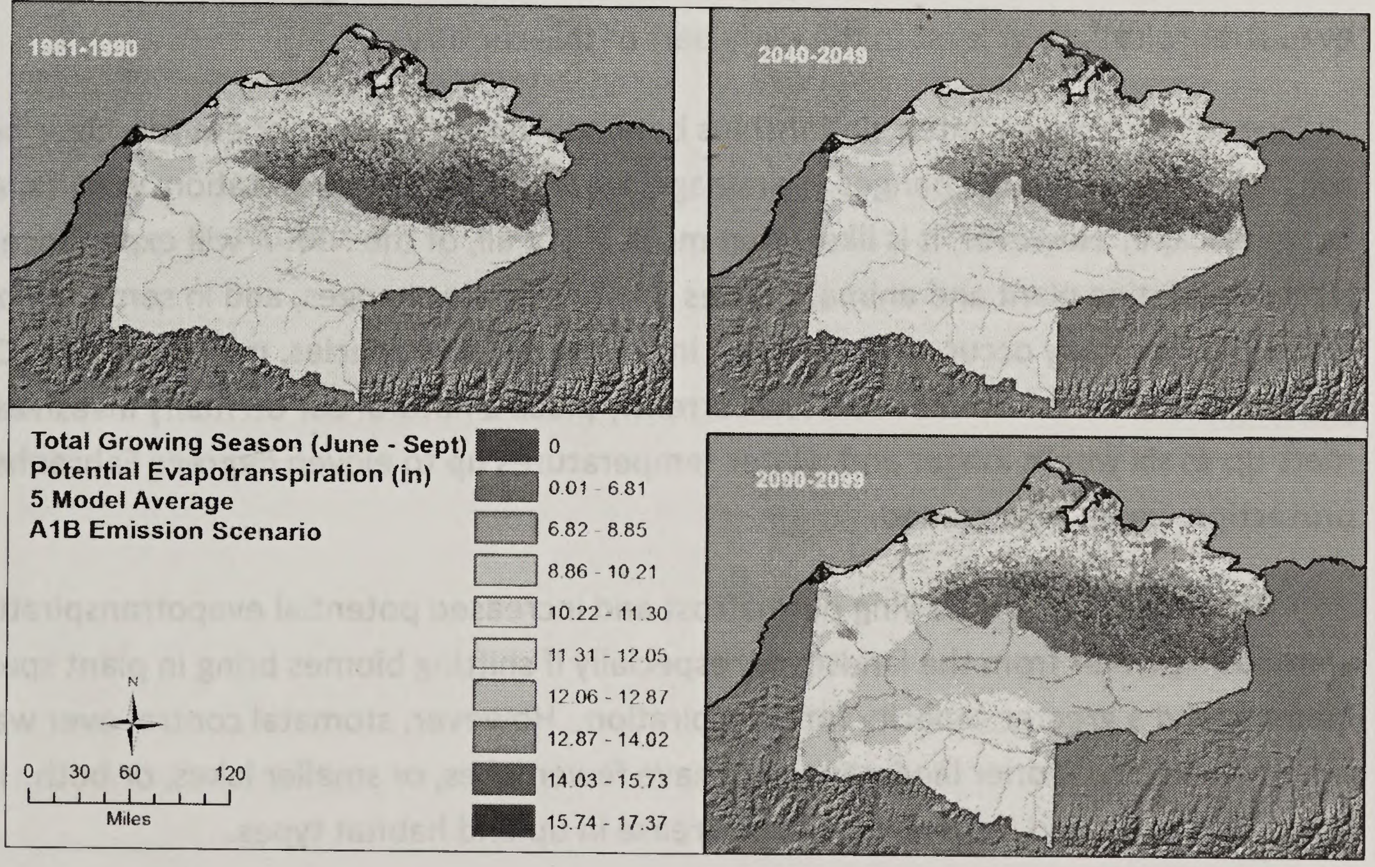
1961-1990
2040-2049
2090-2099
Total Growing Season (June - Sept)
Potential Evapotranspiration (in)
5 Model Average
A1B Emission Scenario
0
0.01 - 6.81
6.82 - 8.85
8.86 - 10.21
10.22 - 11.30
11.31 - 12.05
12.06 - 12.87
12.87 - 14.02
14.03 - 15.73
15.74 - 17.37
N
0 30 60 120
Miles

Figure 14: Predicted Potential Evapotranspiration (PET) during the growing season. PET is expected to remain relatively stable in the early century, but water loss due to increased temperature is likely to increase in the later part of the century. However, the slight hydrologic changes driven by changes in PET and precipitation may be overshadowed by hydrologic changes driven by other climate-related factors, such as permafrost thaw and biome shift.

fluxes and larger soil thermal diffusivities. This deeper thawing allowed tundra species to access deeper stores of water, thus at least partially offsetting the effects of moisture stress caused by climate warming.

Vegetation changes and shorter snow season have the potential to significantly impact estimates of growing season water availability, since increased vegetation or change in vegetative cover increases or alters transpiration. As such, failure to account for temporal changes in land cover variables may have lead to underestimation of the magnitude of drying power. Increase in PET over time may also be driven by reduced surface albedo as a result of decreasing snowcover season. On the other hand, failure to account for stomatal control over transpiration as soils dry out (Blanken and Rouse 2004; Eugster et al. 2000) may have led to overestimates of PET rates.

Summary and Conclusions

Overall, the NPR-A is expected to become much warmer in the middle and latter portion of this century, with a longer growing season, shorter less severe winters, and a deeper active layer in soils. Some increases in precipitation are likely, complete permafrost thaw may occur in limited areas, and fire may become a factor on the landscape. Hydrologic changes are likely, although landscape drying is more likely to be driven indirectly by permafrost thaw and vegetation change than by increases in evapotranspiration, at least in the early part of this century.

Due to the complex interrelationships between variables, it is not entirely clear how these changes will play out in terms of changes in drainage, water availability, vegetation, wildlife, and human uses of the landscape. However, it is likely that most, if not all, of the NPR-A will experience some degree of stress to existing plant and animal species due to climate changes, and in some regions significant shifts in biome may occur. New species, including invasive species, may encroach. Cold winter temperatures and short summer seasons currently place a natural bar on many invasives, but with summers up to six weeks longer and winter temperatures up to eleven degrees Fahrenheit warmer, this protection would be lessened.

The combination of thawing permafrost and increased potential evapotranspiration both point toward losing water from the landscape, especially if shifting biomes bring in plant species with higher biomass and a greater capacity for transpiration. However, stomatal control over water loss may partly offset this trend. A drier landscape may have fewer lakes, or smaller lakes, or both. It may also have fewer wetlands, and a corresponding increase in upland habitat types.

Fire is unlikely to play a large role in the near future, but even small and infrequent fires would represent a new factor to be considered in the NPR-A. Post-fire, there would be a window of opportunity for succession by novel species, meaning that fire may facilitate vegetation shift, which would in turn be likely to affect wildlife.

Other potential changes include, for example, a negative impact on many bird species due to decreased wetlands. However, this loss might result in a corresponding increase in forage and improved habitat for grazers, or might even introduce new habitat for browsers. Many wildlife species are affected, either positively or negatively, by snow cover. While it is hard to predict whether seasonal snowpack would be deeper, it is likely that the snow season would start later and end earlier. Rain on snow events might become more common.

All of the above changes are pertinent to human uses of the landscape. Impacts to vegetation and wildlife directly impact hunting and gathering. Changes in season length affect hunting seasons and food storage, and changes to the depth and duration of frozen soils impact winter travel, construction, and ice roads.

For more information please visit the SNAP website at www.snap.uaf.edu or contact: Dr. Nancy Fresco, Network Coordinator, Scenarios Network for Alaska Planning, University of Alaska, 907-474-2405; nlfresco@alaska.edu

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Works Cited

Blanken, P. D., and Rouse, W. R. (1994) The role of birch-willow forest in the energy balance at treeline. Arctic Alpine Research. 26, 403–411.

Eugster, W., Rouse, W.R., Pielke, R.A. Sr., Joseph P. Mcfadden, J.P., Baldocchi, D.D., Timothy G. F Kittel, T.G.,Chapin, F.S. III, Liston, G.E., Vidale, P.L., Vaganov, E., Chambers, S. (2000). Land-atmosphere energy exchange in arctic tundra and boreal forest: available data and feedbacks to climate. Global Change Biology, 6 (Suppl. 1), 84-115.

Higuera, P. E., Brubaker, L.B. Anderson, P.M., Brown, T.A., Kennedy, A.T., and Hu, F.S. (2008). Frequent Fires in Ancient Shrub Tundra: Implications of Paleorecords for Arctic Environmental Change. PLoS ONE www.plosone.org, 3(3).

Hinzman LD, Bettez ND, Bolton WR, Chapin FS, Dyurgerov MB, Fastie CL, Griffith B, Hollister RD, Hope A, Huntington HP, Jensen AM, Jia GJ, Jorgenson T, Kane DL, Klein DR, Kofinas G, Lynch AH, Lloyd AH, McGuire AD, Nelson FE, Oechel WC, Osterkamp TE, Racine CH, Romanovsky VE, Stone RS, Stow DA, Sturm M, Tweedie CE, Vourlitis GL, Walker MD, Walker DA, Webber PJ, Welker JM, Winker KS, Yoshikawa K (2005) Evidence and implications of recent climate change in northern Alaska and other arctic regions. Climatic Change, 72,251–298.

Jorgenson, MT, Romanovsky V, Harden J, Shur Y, O'Donnell J, Schuur EAG, Kanevskiy M, Marchenko S. (2010). Resilience and vulnerability of permafrost to climate change. Canadian Journal of Forest Research. 40(7):1219-1236Rouse, W. R., Carlson, D.W., and Weick, E. J. (1992). Impacts of summer warming on the energy and water balance of wetland tundra. Climatic Change. 22 (4), 305-326.

Rouse, W. R. (2000). The energy and water balance of high-latitude wetlands: controls and extrapolation. Global Change Biology. 6 (S1), 59–68.

Rouse, W. R., Carlson, D.W., and Weick, E. J. (1992). Impacts of summer warming on the energy and water balance of wetland tundra. Climatic Change. 22 (4), 305-326.

Shutov, V., Gieck, R. E., Hinzman, L. D., Kane, D. L. (2006). Evaporation from land surface in high latitude areas: a review of methods and study results. Nordic Hydrology. 37(4-5), 393-411.

Walsh, J.E., Chapman, W.L., Romanovsky, V., Christensen, J.H., and Stendel, M. (2008). Global Climate Model Performance over Alaska and Greenland. Journal of Climate. 21, 6156-6174.

Woo, M., Lewkowicz, A. G., and Rouse, W. R. (1992). Response of the Canadian Permafrost Environment to Climatic Change. Physical Geography. 13, 287-317.

Yoshikawa, K., Bolton, W.R., Romanovsky, V.E., Fukuda, M, and Hinzman, L.D. (2003). Impacts of wildfire on the permafrost in the boreal forests of Interior Alaska. Journal of Geophysical Research. 108, NO. D1, 8148, doi:10.1029/2001JD000438, 2003

Zhang, K., Kimball, J.S., Mu, Q.Z., Jones, L.A., Goetz, S.J., Running, S.W. (2009). Satellite based analysis of northern ET trends and associated changes in the regional water balance from 1983 to 2005. Journal of Hydrology. 379 (1-2), 92-110.

Appendix A: SNAP Climate Data and Modeling

Use of GCMs to model future climate

General Circulation Models (GCMs) are the most widely used tools for projections of global climate change over the timescale of a century. Periodic assessments by the Intergovernmental Panel on Climate Change (IPCC) have relied heavily on global model simulations of future climate driven by various emission scenarios.

The IPCC uses complex coupled atmospheric and oceanic GCMs. These models integrate multiple equations, typically including surface pressure; horizontal layered components of fluid velocity and temperature; solar short wave radiation and terrestrial infra-red and long wave radiation; convection; land surface processes; albedo; hydrology; cloud cover; and sea ice dynamics.

GCMs include equations that are iterated over a series of discrete time steps as well as equations that are evaluated simultaneously. Anthropogenic inputs such as changes in atmospheric greenhouse gases can be incorporated into stepped equations. Thus, GCMs can be used to simulate the changes that may occur over long time frames due to the release of excess greenhouse gases into the atmosphere.

Greenhouse-driven climate change represents a response to the radiative forcing associated with increases of carbon dioxide, methane, water vapor and other gases, as well as associated changes in cloudiness. The response varies widely among models because it is strongly modified by feedbacks involving clouds, the cryosphere, water vapor and other processes whose effects are not well understood. Changes in the radiative forcing associated with increasing greenhouse gases have thus far been small relative to existing seasonal cycles. Thus, the ability of a model to accurately replicate seasonal radiative forcing is a good test of its ability to predict anthropogenic radiative forcing.

Model Selection

Different coupled GCMs have different strengths and weaknesses, and some can be expected to perform better than others for northern regions of the globe.

John Walsh et al. evaluated the performance of a set of fifteen global climate models used in the Coupled Model Intercomparison Project. Using the outputs for the A1B (intermediate) climate change scenario, they calculated the degree to which each model's output concurred with actual climate data for the years 1958- 2000 for each of three climatic variables (surface air temperature, air pressure at sea level, and precipitation) for three overlapping regions (Alaska only, 60-90 degrees north latitude, and 20-90 degrees north latitude.)

The core statistic of the validation was a root-mean-square error (RMSE) evaluation of the differences between mean model output for each grid point and calendar month, and data from the European

Centre for Medium-Range Weather Forecasts (ECMWF) Re- Analysis, ERA-40. The ERA-40 directly assimilates observed air temperature and sea level pressure observations into a product spanning 1958-2000. Precipitation is computed by the model used in the data assimilation. The ERA-40 is one of the most consistent and accurate gridded representations of these variables available.

To facilitate GCM intercomparison and validation against the ERA-40 data, all monthly fields of GCM temperature, precipitation and sea level pressure were interpolated to the common 2.5° × 2.5° latitude – longitude ERA-40 grid. For each model, Walsh et al. calculated RMSEs for each month, each climatic feature, and each region, then added the 108 resulting values (12 months x 3 features x 3 regions) to create a composite score for each model. A lower score indicated better model performance.

The specific models that performed best over the larger domains tended to be the ones that performed best over Alaska. Although biases in the annual mean of each model typically accounted for about half of the models' RMSEs, the systematic errors differed considerably among the models. There was a tendency for the models with the smaller errors to simulate a larger greenhouse warming over the Arctic, as well as larger increases of Arctic precipitation and decreases of Arctic sea level pressure when greenhouse gas concentrations are increased. Since several models had substantially smaller systematic errors than the other models, the differences in greenhouse projections implied that the choice of a subset of models might offer a viable approach to narrowing the uncertainty and obtaining more robust estimates of future climate change in regions such as Alaska. Thus, SNAP selected the five best-performing models out of the fifteen: MPI_ECHAM5, GFDL_ CM2_1, MIROC3_2_MEDRES, UKMO_HADCM3, and CCCMA_CGCM3_1 These five models are used to generate climate projections independently, as well as in combination, in order to further reduce the error associated with dependence on a single model.

Downscaling model outputs

Because of the enormous mathematical complexity of GCMs, they generally provide only large-scale output, with grid cells typically 1°-5° latitude and longitude. For example, the standard resolution of HadOM3 is 1.25 degrees in latitude and longitude, with 20 vertical levels, leading to approximately 1,500,000 variables. Finer scale projections of future conditions are not directly available. However, local topography can have profound effects on climate at much finer scales, and almost all land management decisions are made at much finer scales. Thus, some form of downscaling is necessary in order to make GCMs useful tools for regional climate change planning. Historical climate data estimates at 2km resolution are available from PRISM (Parameter-elevation Regressions on Independent Slopes Model), which was originally developed to address the lack of climate observations in mountainous regions or rural areas. PRISM uses point measurements of climate data and a digital elevation model to generate estimates of annual, monthly and event-based climatic elements. Each grid cell is estimated via multiple regression using data from many nearby climate stations. Stations are weighted based on distance, elevation, vertical layer, topographic facet, and coastal proximity. PRISM offers data at a fine scale useful to land managers and communities, but it does not offer climate projections. Thus, SNAP needed to link PRISM to GCM outputs. This work was also done by John Walsh, Bill Chapman, et al. They first calculated mean monthly precipitation and mean monthly surface air temperature for PRISM grid cells for 1961-1990, creating PRISM baseline values. Next, they calculated GCM baseline values for each of the five selected models using mean monthly outputs for 1961-1990. They then calculated differences between projected GCM values and baseline GCM values for each year out to 2099 and created "anomaly grids" representing these differences. Finally, they added these anomaly grids to PRISM baseline values, thus creating fine-scale (2 km) grids for monthly mean temperature and precipitation for every year out to 2099. This method effectively removed model biases while scaling down the GCM projections. Based on this small-scale grid, SNAP now has mean monthly temperature and precipitation projections for 353 communities statewide based on the means of all five selected models. SNAP also has the ability to turn these datasets into static maps and GIS layers.

Appendix B: Uncertainty

All projections of future climate are uncertain. Understanding the sources of this uncertainty can help in interpreting how these projections can best be used and interpreted.

Raw climate projections

SNAP's most basic climate data are our monthly mean values for temperature and precipitation, available for every month of every year from 1900-2006 (historical data) and 1980-2099 (projected data). The projected data are available for five different models and three different emission scenarios.

Both datasets are subject to uncertainty based on interpolation, gridding and downscaling, as well as uncertainty based on the inherent variability of weather from month to month and year to year.

Interpolation, gridding and downscaling

- Climate stations are very sparse in the far north, and precipitation in particular can vary enormously over very small areas and time frames so interpolation is challenging and imperfect regardless of method
- PRISM uses point data, a digital elevation model, and other spatial data sets to generate gridded estimates
- CRU data uses different algorithms from PRISM, and does not utilize data on slope and aspect and proximity to coastlines
- Overall, PRISM seems to do the best job of capturing landscape climate variability

Natural variability

- Even when trends (e.g. warming climate) are occurring, they can be obscured by normal ups and downs in weather patterns
- GCM outputs simulate this normal variability, but the variations cannot be expected to match actual swings
- Uncertainty is inevitably greater for precipitation than for temperature

Projected data are also subject to uncertainty related to the accuracy of the Global Circulation Models upon which they are based.

Inputs to GCMs

- Solar radiation is essentially a known quantity
- Levels of greenhouse gases are uncertain, but accounted for by varying emissions scenarios

GCM algorithms

- Oceanic and atmospheric circulation are extremely hard to predict and model
- May include thresholds (tipping points) such as ocean currents shifting or shutting down
- Don't fully account for short-term phenomena such as the Pacific Decadal Oscillation (PDO)

Processed data and linked models

SNAP products that link our raw data (monthly climate data) to other models must be interpreted in the context of the combined uncertainty of the raw data and the models to which it is linked. The list below is not exhaustive, since new projects are continually being developed.

Fire

- The ALFRESCO model uses SNAP input to project fire on the landscape
- This model depends on assumptions and estimates regarding the frequency and location of fire starts and the relationship between climate, forest age and type, and fire spread
- These values have been calibrated using historical data

Permafrost

- SNAP permafrost modeling has been performed in conjunction with experts at the Geophysical Institute Permafrost Lab
- Algorithms to determine the depth of active layer are dependent on calculations of the insulating properties of varying ground cover and soil types, as well as on climate variables

Vegetation Change

- SNAP has worked with multiple partners in the US and Canada to predict potential landscape shifts driven by climate change
- These projections are dependent upon the linkages between vegetation and climate, as well as the ability of various species to shift across the landscape under either gradual or threshold-driven change

Dealing with uncertainty

Natural Variability

Averaging across all five models (using the composite model) can reduce the ups and downs built into the models

Averaging across years (decadal averages) can reduce uncertainty due to natural variability

GCM uncertainty

Variation between models can be used as a proxy for uncertainty in GCM algorithms

Averaging across all five models (using the composite model) can reduce any potential bias

SNAP's model validation study depicts uncertainty by region, model, and data type based on comparisons between model results and actual station data

Interpolation, gridding, and downscaling

In some cases, differences between CRU and PRISM data can be viewed as a proxy for uncertainty in downscaling

Linked models

- Approaching the same question using multiple linked models can serve as a form of validation
- Ground-truthing using historical data is important – as has been done in all ALFRESCO runs as a means of calibration
- Scenarios planning (allowing for more than one possible future) allows for greater flexibility in the face of high uncertainty

Appendix C: Calculation of Potential Evapotranspiration (PET) using the Priestley-Taylor Method

A variety of methods can be used to estimate evaporation from land surfaces and resulting moisture balance, each with its own set of benefits and drawbacks (Shutov et al. 2006). Methods are selected based on available data and model reliability. For this project, the primary model used to estimate PET was the Preistley-Taylor model:

$$PET = \left(\frac{1}{\lambda}\right) * \alpha * \left(\frac{s}{s+\gamma}\right) * (R - G)$$

where,

PET	potential evapotranspiration [mm day^{-1}]
λ	latent heat of vaporization of water at 20°C = 2.45 [MJ kg^{-1}]
α	adjusts PET for surface characteristics = 1.26 [unitless]
s	slope of the curve of the saturation vapor pressure curve [kPa °C^{-1}]
γ	psychrometric constant [kPa °C^{-1}]
R	net radiation [MJ m^{-2} day^{-1}]
G	heat flux from the ground surface [MJ m^{-2} day^{-1}]

Note that all calculations were performed with monthly averages; the daily rates derived here can then be multiplied by the number of days in a month to get accumulated monthly PET.

$\left(\frac{s}{s+\gamma}\right)$ - slope of the vapor pressure curve and the psychrometric constant

$$\frac{s}{s+\gamma} = 0.406 + 0.011T$$

where,

T is mean monthly air temperature [°C]

This equation was developed for and tested in boreal forest and tundra environments. It is unclear whether it is entirely appropriate for strongly marine influenced systems or high alpine environments.

R - net radiation

$$R = (1 - a) * Rs - Rl$$

where,

a is fractional albedo

Rs is incoming shortwave radiation [MJ m^{-2} day^{-1}]

Rl is net longwave radiation in the *outgoing direction* [MJ m^{-2} day^{-1}]

Rs is incoming shortwave radiation [MJ m^{-2} day^{-1}]

Rl is net longwave radiation in the *outgoing direction* [MJ m^{-2} day^{-1}]

Note that if Rl is calculated by the standard sign conventions, this equation must be written as

$$R = (1 - a) * Rs + Rl$$

Surface	Albedo
Open Water	0.06
Wetland Tundra	0.15
Upland Tundra	0.16
Boreal Coniferous Forest	0.08
Boreal Deciduous Forest	0.16
Barren Land	0.20
Perennial Ice/Snow	0.40

a - albedo

This project used static albedo values. This is likely to introduce some error, as albedo would typically be higher when snow is present. Since albedo values in Eugster et al. (2000) are primarily mid-summer overcast-day minimum albedo values, they are at the low end of published values (see Betts and Ball 1997; Duchon and Hamm 2006). The albedo value used here for water is probably for low- or mid-latitude solar incidence angles and could likely be higher under polar light conditions (Barry and Chorley 2003). However, we are using the values selected by B. O'Brien.

Rs - incoming shortwave radiation at the surface

$$Rs = kRa(Tmax - Tmin)^{0.5}$$

where,

k Hargreaves coefficient a constant [°$C^{-0.5}$]
Ra is solar radiation at the top of the atmosphere [MJ m^{-2} day^{-1}]

Tmax and Tmin are monthly average maximum and minimum temperature [°C]

The Hargeaves coefficient is a constant set to 0.16 in the interior and 0.19 in regions deemed to have a marine influence (Allen et al. 1998). It is likely that the spatial distribution and extent of areas that experience predominantly marine vs. interior airmasses may change in the future; thus our use of static k values may be somewhat inaccurate.

Ra - incoming solar radiation at the top of the atmosphere

$$Ra = \frac{24 * 60}{\pi} * d * S[\omega \sin(\varphi) \sin(\delta) + \cos(\varphi) \cos(\delta) \sin(\omega)]$$

where,

S is the solar constant [0.082 MJ m^{-2} min^{-1}]
ω is the sunset hour angle [radians]
d is the inverse of the Earth-Sun distance
ϕ is latitude [radians]
δ is the declination [radians]

w - sunset hour angle

$$\omega = \cos^{-1}[-\tan(\delta)\tan(\varphi)]$$

d - inverse earth-sun distance

$$d = 1 + 0.033\cos\left(\frac{2\pi}{365}J\right)$$

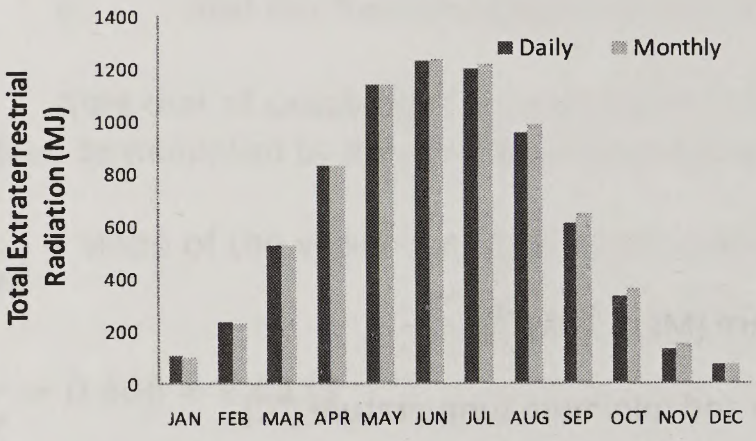
δ - declination

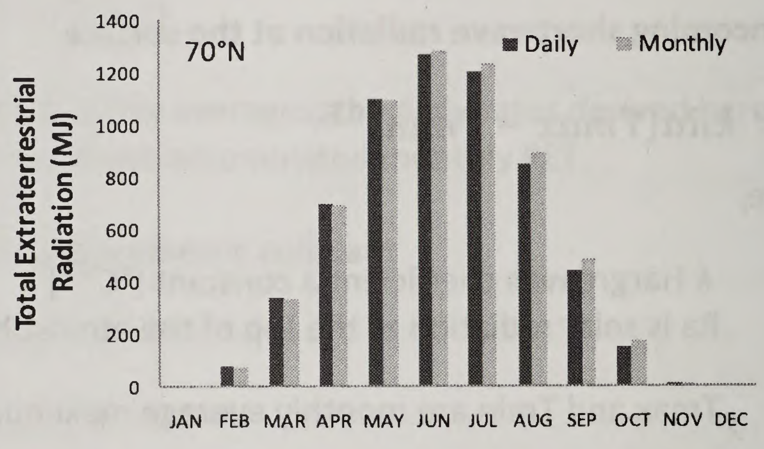
$$\delta = 0.409 * \sin\left[\frac{2\pi}{365}J - 1.39\right]$$

where,

J is the Julian Day of the year.

When the sun does not rise ω is set equal to 0, and when the sun does not set ω is set equal to π. In order to calculate Ra at a monthly time step, we calculated average daily radiation for each day within the month and then average across the month.





Rl - net longwave radiation in the outgoing direction

$$Rl = -f\varepsilon\sigma(Tave + 273.15)^4$$

where,

f is a cloud factor, calculated below
ε is the emissivity, calculated below
σ is the Stefan-Boltzmann constant [4.903 10^{-9} MJ K^{-4} m^{-2} day^{-1}]
Tave is average temperature [°C]

Cloud factor

$$f = \frac{Rs}{Rcs}$$

where,

Rs is incoming shortwave radiation [MJ m^{-2} day^{-1}]
Rcs is clear-sky shortwave radiation

Clear-sky shortwave radiation

$$Rcs \;=\; (0.75 + 2 * 10^{-5} z) * Ra$$

where,

z is elevation [m]
Ra is solar radiation at the top of the atmosphere [MJ m^{-2} day^{-1}]

Emissivity

$$\varepsilon = \; -0.02 + 0.261 e^{-0.000777 Tave^{2}}$$

This equation produces net longwave radiation with the common sign convention. To use the net radiation equation used here, remove the leading minus sign.

Temperature

All temperatures needed are calculated from SNAP-downscaled CRU or GCM output, in combination with the 1961-90 PRISM climatology.

$$PRISM.Tave = 0.5 * (0.1 * PRISM.Tmax + 0.1 * PRISM.Tmin)$$

$$Tmax = 0.1 * PRISM.Tmax + (Tave - PRISM.Tave)$$

$$Tmin = 0.1 * PRISM.Tmin + (Tave - PRISM.Tave)$$

Appendix D:

Essential Fish Habitat

Appendix D: Essential Fish Habitat

D.1 Regulatory Background

The 1996 Sustainable Fisheries Act (Public Law 104-297) enacted additional management measures to protect commercially harvested fish species from overfishing. Along with reauthorizing the Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265 [Magnuson-Stevens Act), one of those added measures is to describe, identify, and minimize adverse effects to "essential fish habitat." Definitions and rules involving essential fish habitat are in 50 CFR Part 600. The National Marine Fisheries Service implements the requirements of the Magnuson-Stevens Act.

> **Essential fish habitat definition:** "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of essential fish habitat: 'Waters' include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle" (50 CFR Part 600.10).
>
> **Adverse effect definition:** "...any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions" (50 CFR Part 600.810).
>
> **Federal action requirement:** "For any Federal action that may adversely affect EFH, Federal agencies must provide National Marine Fisheries Service with a written assessment of the effects of that action on EFH.... Federal agencies may incorporate an EFH Assessment into documents prepared for other purposes such as...the National Environmental Policy Act" (50 CFR Part 600.920).

In 1997, the National Marine Fisheries Service issued an interim final rule to implement the essential fish habitat provisions of the Magnuson-Stevens Act (62 FR 66531). This included the clarification that Regional Fishery Management Councils would describe and identify essential fish habitat in fishery management plans. In Alaska, fishery management plans are developed by the North Pacific Fishery Management Council and approved by Secretary of Commerce. In 2002, National Marine Fisheries Service issued a final rule with no substantial changes to the interim rule (67 FR 2343).

D.2 Arctic Essential Fish Habitat

Fish species with essential fish habitat designated in and near the NPR-A include all five species of Pacific salmon [chum (*Oncorhynchus keta*), pink (*O. gorbuscha*), Chinook (*O. tshawytscha*), coho (*O. kisutch*), and sockeye (*O. nerka*)], Arctic cod (*Boregogadus saida*), and saffron cod (*Eleginus gracilis*). Salmon are managed under the "Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska" (Salmon Fishery Management Plan; North Pacific Fishery Management Council 1990). Arctic cod and saffron cod in the Chukchi and Beaufort seas are managed under the "Fishery Management Plan for Fish Resources of the Arctic Management Area" (Arctic Fishery Management Plan; North Pacific Fishery Management Council 2009).

D.2.1 Pacific Salmon

All of the salmon species have anadromous life histories that are described broadly in Table D-1 according to Mecklenburg et al. (2002). For more detailed information on each species, see Groot and Margolis (1991).

Table D–1. Pacific salmon life history characteristics

Species	Spawning habitat	Migration to sea from spawning habitat	Time at sea
Chum salmon	Freshwater	Immediately	3 to 5 years
Pink salmon	Freshwater or intertidal zone	Immediately	18 months
Chinook salmon	Freshwater	3 months to 2 years	1 to 5 years
Coho salmon	Freshwater	1 to 4 years	2 to 3 years
Sockeye salmon	Freshwater (lakes)	1 to 2 years	1 to 4 years

In the northeast Chukchi Sea and western Beaufort Sea, all five species of Pacific salmon have been reported (Craig and Haldorson 1986). However, salmon have a very difficult time establishing sustainable runs in the Arctic, most likely because of marginal freshwater habitats (Craig 1989a; Fechhelm and Griffiths 2001). Pink and chum salmon occur in the greatest numbers. Although the number of actual spawning stocks (versus probable stray runs) is unknown, they are relatively common in the Chukchi Sea and Beaufort Sea (Fechhelm and Griffiths 2001; Moss et al. 2009).

Chinook salmon are much more uncommon in the NPR-A and its coastal waters and sockeye and coho salmon are rare. Due to the colder temperatures in the Beaufort Sea, these salmon species are more likely to be present in the northeast Chukchi Sea, although captures anywhere north of Point Hope are most commonly limited to only one or a few individuals (Craig and Haldorson 1986). In 17 years of summer coastal sampling in the Prudhoe Bay region of the Beaufort Sea (1981–1997), only one king salmon and zero sockeye or coho salmon were captured (Fechhelm and Griffiths 2001). However, in the recent decade there have been some years with notable increases in king salmon captured in the Elson Lagoon subsistence fishery further to the west (George 2006, pers. comm.).

The most current essential fish habitat descriptions for salmon in the Arctic are included in amendments 7 and 8 to the Salmon Fishery Management Plan (North Pacific Fishery Management Council 2006), which implemented the preferred alternative from the "Environmental Impact Statement for Essential Fish Habitat Identification and

Conservation in Alaska" (National Marine Fisheries Service 2005). This describes essential fish habitat that encompasses all life history stages for all Pacific salmon species as marine waters extending to the outer limit of the U.S. Exclusive Economic Zone, estuarine waters extending to the salinity transition zone, and freshwaters that are identified as being used by salmon in Alaska Department of Fish and Game's "Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes" (Alaska Department of Fish and Game 1998), also known as the "Anadromous Waters Catalog." The outer limit of the U.S. Exclusive Economic Zone is 200 nautical miles; for analysis purposes here, the salinity transition zone is considered to be 10 kilometers offshore, as this is typically the greatest extent of the estuarine band that forms along the coast of the Beaufort Sea during the summer (Craig 1984a); and a more recent version of freshwaters documented as being utilized by salmon is available in the current version of the Anadromous Waters Catalog (Alaska Department of Fish and Game 2011a). These essential fish habitat designations for salmon are shown on Map D-1. Table D-2 lists the stream and river systems with essential fish habitat in the NPR-A.

Table D–2. Stream and river systems in the NPR-A with freshwater essential fish habitat based on the Anadromous Waters Catalog

Stream system	AWC Code	Salmon species utilizing
Colville River	330-00-10700	pink, chum
Fish Creek	330-00-10840	pink, chum, Chinook
Ublutuoch River	330-00-10840-2017	pink, chum, Chinook
Judy Creek	330-00-10840-2043	pink, chum
Ikpikpuk River	330-00-10900	pink, chum
Chipp River	330-00-10915	pink, chum
Meade River	330-00-10920	chum
Kugrua River	330-00-10940	pink, chum
Kuk River	330-00-10980	pink
Kungok River	330-00-10980-2004	pink
Mikigealiak River	330-00-10980-2004-3009	pink
Ivisaruk	330-00-10980-2009	pink
Kaolak River	330-00-10980-2101	pink
Utukok River	330-00-11100	pink, chum
Kokolik River	330-00-11200	pink, chum

Source: Alaska Department of Fish and Game (2011a)

D.2.2 Arctic Cod and Saffron Cod

Arctic cod are considered semi-pelagic because of their wide distribution throughout demersal and pelagic habitats (Gusey 1988). Individuals mature around 2 to 3 years of age, spawning occurs only once in a lifetime, and 6 to 7 years is the maximum age (Cohen et al. 1990). They are one of the most abundant fish species found in Arctic coastal waters, although they can be found in a broad range of habitats, including offshore, lagoons and inlets, and river mouths (Fechhelm et al. 1984; Moulton and Tarbox 1987; Gusey 1988; Johnson et al. 2010). Abundance tends to be greatest in nearshore habitats during the summer and in offshore habitats during winter (Craig et al. 1982; Craig 1984a). They are believed to be the most important consumer of secondary production in the Alaskan

Beaufort Sea (Frost and Lowry 1983) and serve as a substantial prey item for marine mammals, birds, and other fishes (Bradstreet and Cross 1982; Frost and Lowry 1984).

Saffron cod are demersal (i.e., living on or near the seabed) as adults (Gusey 1988). Individuals mature around 2 to 3 years of age, after which they spawn once a year, and 10 to 14 years is the maximum age (Cohen et al. 1990). Distributions are primarily in moderately saline nearshore habitats for much of the year, although they may migrate for summer feeding into brackish coastal habitats or up rivers within the zone of tidal influence (Fechhelm et al. 1984; Mecklenburg et al. 2002). Saffron cod are also a chief prey item for marine mammals, birds, and other fishes (Frost and Lowry 1984; Gusey 1988).

The most current descriptions of essential fish habitat for Arctic cod and saffron cod are in the 2009 Arctic Fishery Management Plan. For both species, there is inadequate data to determine essential fish habitat for eggs, larvae, and early juveniles. The current extent of essential fish habitat is the general distribution areas for late juveniles and adults. The general distribution area for Arctic essential fish habitat is defined as “the area where presence has been documented by research effort and confirmed by species experts”. These essential fish habitat designations are shown on Map D-1.

Proposed Action

The NPR-A consists of 23 million acres located on the North Slope of Alaska. The BLM is undertaking the NPR-A Integrated Activity Plan/Environmental Impact Statement (IAP/EIS) to determine the appropriate management of all BLM-managed lands in the NPR-A in light of new information about surface and subsurface resources, and in a manner consistent with existing statutory direction from the Naval Petroleum Reserves Production Act of 1976, as amended. The BLM will consider consistent oil and gas leasing stipulations and best management practices across the entire NPR-A, while providing special protections for specific habitats and site-specific resources and uses. The BLM will also provide an opportunity, subject to appropriate conditions developed through a NEPA process, to construct necessary onshore infrastructure, primarily pipelines and roads, to bring oil and gas resources from leases in the Chukchi Sea to the Trans-Alaska Pipeline System.

Potential Adverse Effects on Essential Fish Habitat

The potential adverse effects on essential fish habitat from oil and gas activities would be the same as those described for other fish habitat in Chapter 4. No effects on marine essential fish habitat would be expected. Potential effects on estuarine essential fish habitat would primarily be related to causeways, or other similar structures, described in detail in section 4.3.7.2 in Volume 2. Ineffective design of coastal structures can lead to substantially altered water quality and create barriers to fish movements. Potential effects on freshwater essential fish habitat from a variety of oil and gas activities described in detail in section 4.3.7.2 in Volume 2 broadly include altered water quality, physical habitat changes (water quantity, flow patterns, and geomorphology), point and non-point source pollution, increased turbidity and sedimentation, and barriers to fish movements.

The primary difference among alternatives is the level of anticipated oil and gas development. Based on the extent of coastline susceptible to development, the greatest potential impacts to estuarine essential fish habitat would occur under Alternative D, with increasingly less risk under alternatives A, C, and B-2, and B-1, respectively. Based on the distribution of lands available for oil and gas leasing relative to waters listed for salmon in the Anadromous Waters Catalog (Alaska Department of Fish and Game 2011a), the greatest potential impacts to freshwater essential fish habitat would occur under Alternative D, with increasingly less risk under alternatives C, A, and B-2, and B-1, respectively.

Proposed Mitigation Measures

Lease stipulations and required operating procedures (under Alternative A) or best management practices (under alternatives B-1, B-2, C, and D) would mitigate potential effects on essential fish habitat. Proper implementation of these protective measures should ensure that impacts to essential fish habitat are avoided or minimized. The following list summarizes the mitigation measures; details for each measure can be found in Table 2-3 in Chapter 2, Volume 1. These management standards largely address relevant comparable Recommended Conservation Measures identified in “Impacts to Essential Fish Habitat from Non-fishing Activities in Alaska” (National Marine Fisheries Service 2011).

- **Required Operating Procedure/Best Management Practice A-2:** Requires comprehensive waste management plan.
- **Required Operating Procedure/Best Management Practice A-3:** Requires a hazardous materials emergency contingency plan.
- **Required Operating Procedure/Best Management Practice A-4:** Requires a comprehensive spill prevention and response contingency plan.
- **Required Operating Procedure/Best Management Practice A-5:** Establishes refueling setbacks from waterbodies.
- **Required Operating Procedure/Best Management Practice A-6:** Prohibits discharge of reserve-pit fluids.
- **Required Operating Procedure/Best Management Practice A-7:** Prohibits discharge of produced water in upland areas and marine waters.
- **Required Operating Procedure/Best Management Practice B-1:** Prohibits water withdrawals from rivers and streams during winter.
- **Required Operating Procedure/Best Management Practice B-2:** Establishes lake water withdrawal limits and practices to protect fish.
- **Required Operating Procedure/Best Management Practice C-2:** Requires sufficient ground frost and snow cover prior to winter overland moves, contributing to the protection of stream banks and frozen waterbodies.
- **Required Operating Procedure/Best Management Practice C-3:** Establishes winter river and stream crossing guidelines related to protecting runoff patterns, fish passage, and natural channel characteristics, including the requirement that crossings reinforced with additional snow or ice ("bridges") be removed, breached, or slotted before spring breakup.
- **Required Operating Procedure/Best Management Practice C-4:** Establishes winter river and stream crossing guidelines related to avoiding additional freeze-down into fish habitat, including restrictions on traveling up and down streambeds.

- **Lease Stipulation D-1:** Prohibits exploratory drilling within the floodplain of rivers and streams and within fish-bearing lakes.
- **Lease Stipulation D-2:** Prohibits construction of permanent or gravel facilities (including pads, roads, and airstrips) for exploratory drilling.
- **Required Operating Procedure/Best Management Practice E-1:** Requires that all roads be designed, constructed, maintained, and operated in a manner that minimizes environmental impacts.
- **Lease Stipulation E-2:** Prohibits permanent facilities (including pads, roads, airstrips, and pipelines) within 500 feet of fish-bearing waterbodies, except for essential road and pipeline crossings that will be permitted on a case-by-case basis.
- **Lease Stipulation E-3:** Prohibits causeways, docks, artificial gravel islands, and bottom-founded structures in river mouths or deltas. Requires that the design of any coastal structure ensures free fish passage and doesn't cause significant changes to nearshore oceanographic circulation patterns and water quality characteristics.
- **Required Operating Procedure/Best Management Practice E-4:** Requires that pipelines be designed, constructed, and operated according to the best available technology for detecting and preventing corrosion that can lead to leaks.
- **Required Operating Procedure/Best Management Practice E-5:** Establishes guidelines to minimize the development footprint, which would minimize the total impervious surface area within individual drainages.
- **Required Operating Procedure/Best Management Practice E-6:** Requires that stream and marsh crossings be designed and constructed to ensure free fish passage, reduce erosion, maintain natural drainage, and minimize effects to natural stream flow.
- **Required Operating Procedure/Best Management Practice E-8:** Establishes gravel mine guidelines for design that will minimize negative effects on fish habitat and for reclamation that will promote potential positive effects on fish habitat.
- **Required Operating Procedure/Best Management Practice E-14:** Requires that stream and river road crossings utilize the most current design tools that will facilitate free fish passage, including a minimal of 3 years of hydrology and fish data to guide decisions.
- **Lease Stipulation/Best Management Practice K-1:** Establishes setback distances for permanent facilities (including pads, roads, airstrips, and pipelines) of 0.5 mile, 0.75 mile, 1 mile, and, under Alternative B-1 and B-2, 2 miles from many major streams and rivers, except for essential road and pipeline crossings that will be permitted on a case-by-case basis.
- **Lease Stipulation/Best Management Practice K-3b (Alternatives A, B-1, B-2, and C only):** Establishes additional protective measurements for "major coastal waterbodies" regarding exploration and development.
- **Lease Stipulation/Best Management Practice K-8b** (Does not apply to Alternative B-2): Prohibits permanent facilities within the existing Kasegaluk Lagoon Special Area.

Essential Fish Habitat Finding

No marine essential fish habitat impacts are probable based on the scope of the proposed action. Estuarine essential fish habitat would receive sufficient protection by considerations for coastal structures under Lease Stipulation E-3, which would avoid impacts such as those caused by causeways in the Prudhoe Bay area (section 4.3.7.2 in Volume 2). The multitude of other lease stipulations and required operating procedures/best management practices listed above would provide substantial environmental protections that would minimize or avoid effects on freshwater essential fish habitat. Although unavoidable impacts will occur to some freshwater habitat in the NPR-A, those streams and rivers with freshwater essential fish habitat are much less likely to experience those impacts. For example, all streams and rivers currently considered freshwater essential fish habitat (Table D-2 above) are provided an additional safeguard through infrastructure setbacks included in Lease Stipulation/Best Management Practice K-1. Also, since streams and rivers comprising freshwater essential fish habitat are listed within the Anadromous Waters Catalog, they are granted further regulatory protection under the Anadromous Fish Act (AS 16.05.871) which requires additional review and permitting of activities by Alaska Department of Fish and Game. Based on these considerations, oil and gas exploration and development in the NPR-A is assigned the essential fish habitat assessment determination: May affect, not likely to adversely affect.

Appendix E:

Common, Scientific and Iñupiaq Names of Species Listed in the IAP/EIS

Appendix E: Common, Scientific and Iñupiaq Names of Species Listed in the IAP/EIS

Table E–1. Common, scientific and Iñupiaq names of species listed in this document

Common name	Scientific name	Iñupiaq name[1]
VEGETATION		
Small trees and shrubs		
Alpine blueberry	*Vaccinium uliginosum*	Subaq/asriavik/asiaq/asiavik
Cloudberry	*Rubus chamaemorus*	Aqpik
Crowberry	*Empetrum nigrum*	Paunbaq
Dwarf birch	*Betula nana* ssp. *exilis*	—
Lapland cassiope	*Cassiope tetragona*	Ikubutigiksut
Lingonberry	*Vaccinium vitis-idaea*	Kikmieeaq/kipmifnaq
Northern Labrador tea	*Ledum palustre ssp. decumbens*	Tilaaqiaq
Mountain alder	*Alnus viridis* ssp. *crispa*	—
Grasses		
(unknown)	*Poa lanata*	—
Alkali grass	*Puccinellia phryganodes*	—
Alaska bluegrass	*Poa hartzii ssp. alaskana*	—
Pendent grass	*Arctophila fulva*	—
Polar grass	*Arctagrostis latifolia*	—
False semaphoregrass	*Pleuropogon sabinei*	—
Eurasian Junegrass	*Koeleria asiatica*	
Tufted hairgrass	*Deschampsia ceaspitosa*	—
Sedges		
Cottongrass	*Eriophorum angustifolium*	—
Cottongrass	*Eriophorum russeolum*	—
Tussock cottongrass	*Eriophorum vaginatum L.*	Maniq
Water sedge	*Carex aquatilis*	—
Wildflowers		
Fewflower draba	*Draba pauciflora*	—
Drummond's bluebell	*Mertensia drummondii*	—
Fireweed	*Epilobium latifolium*	Quppiqutaq
Marsh fivefinger	*Potentilla palustris*	—
Marsh marigold	*Caltha palustris*	—
Pygmy aster	*Aster pygemaeus*	—
Scurvy grass	*Cochlearia officianalis*	—
Stipulated cinquefoil	*Potentilla stipularis*	—
Sweet coltsfoot	*Petasites frigidus*	—

Table E–1. Common, scientific and Iñupiaq names of species listed in this document

Common name	Scientific name	Iñupiaq name[1]
FISH		
Freshwater species		
Alaska blackfish	*Dallia pectoralis*	Iłuuqiniq
Arctic char	*Salvelinus alpinus*	—
Arctic grayling	*Thymallus arcticus*	Sulukpaugaq
Burbot	*Lota lota*	Tittaaliq
Lake trout	*Salvelinus namaycush*	Iqaluaqpak
Longnose sucker	*Catostomus catostomus*	Milugiaq
Ninespine stickleback	*Pungitius pungitius*	Kakalisaauraq
Northern pike	*Esox lucius*	Siulik
Round whitefish	*Prosopium cylindraceum*	Savigunnaq
Slimy sculpin	*Cottus cognatus*	Kanayuq
Threespine stickleback	*Gasterosteus aculatus*	—
Anadromous species		
Arctic cisco	*Coregonus autumnalis*	Qaataq
Arctic lamprey	*Lampetra japonica*	Nimigiaq
Bering cisco	*Coregonus laurettae*	Tiipuq
Chinook (king) salmon	*Oncorhynchus tschawytscha*	—
Chum salmon	*Oncorhynchus keta*	Iqalugruaq
Pink salmon	*Oncorhynchus gorbuscha*	Amaqtuuq
Rainbow smelt	*Osmerus mordax*	Iłhauġniq
Sockeye (red) salmon	*Oncorhynchus nerka*	—
Amphidromous species[2]		
Broad whitefish	*Coregonus nasus*	Aanaaqłiq
Dolly varden	*Salvelinus malma*	Iqalukpik
Humpback whitefish	*Coregonus pidschian*	Piquktuuq
Least cisco	*Coregonus sardinella*	Iqalusaaq
Marine species[3]		
Arctic cod	*Boregogadus saida*	Uugaq
Arctic flounder	*Liopsetta glacialis*	Nataaġnaq/Puyyagiaq
Capelin	*Mallotus villosus*	Panmigriq
Fourhorn sculpin	*Myoxocephalus quadricornus*	Kanayuq
Kelp snailfish	*Liparis tunicatus*	—
Pacific herring	*Clupea harengus*	Uqsruqtuuq
Pacific sandlance	*Ammodytes hexapterus*	—
Saffron cod	*Eleginus gracilis*	Uugaq
Arctic cod	*Boregogadus saida*	Uugaq

Table E–1. Common, scientific and Iñupiaq names of species listed in this document

Common name	Scientific name	Iñupiaq name[1]
BIRDS		
Seabirds		
Arctic tern	*Sterna paradisea*	Mitqutailxaq
Black guillemot	*Cepphus grylle*	Ifabiq
Glaucous gull	*Larus hyperboreus*	Nauyavasrugruk
Long-tailed jaeger	*Stercorarius longicaudus*	Isuffaq
Parasitic jaeger	*Stercorarius parasiticus*	Mibiaqsaayuk
Pomarine jaeger	*Stercorarius pomarinus*	Isuffabluk
Sabine's gull	*Xema sabini*	Aqargigiaq
Loons		
Pacific loon	*Gavia pacifica*	Malbi
Red-throated loon	*Gavia stellata*	Qaksrauq
Yellow-billed loon	*Gavia adamsii*	Tuutlik
Waterfowl		
Brant	*Branta nigricans*	Niblinbaq
Canada goose	*Branta canadensis*	Iqsrabutilik
Common eider	*Somateria mollissima*	Amauligruaq
King eider	*Somateria spectabilis*	Qifalik
Lesser snow goose	*Anser caerulescens caerulescens*	—
Long-tailed duck	*Clangula hyemalis*	Aahaaliq
Northern pintail	*Anas acuta*	Kurugaq
Scaup	*Aythya* spp.	—
Scoter	*Melanitta* spp.	—
Spectacled eider	*Somateria fischeri*	Qavaasuk
Steller's eider	*Polysticta stelleri*	Igniqauqtuq
Tundra swan	*Cygnus columbianus*	—
White-fronted goose	*Anser albifrons*	Kigiyuk/niblivaixuk
Shorebirds		
American golden-plover	*Pluvialis dominica*	Tullik
Baird's sandpiper	*Erolia bairdii*	Puviaqtuuyaaq
Bar-tailed godwit	*Limosa lapponica*	Turraaturaq
Black-bellied plover	*Squatarola squatarola*	Tullikpak
Buff-breasted sandpiper	*Tryngites subruficollis*	Satqagiixaq
Dunlin	*Erolia alpina*	Siiyukpaligauraq
Long-billed dowitcher	*Linnodromus scolopaceus*	Siiyukpalik
Pectoral sandpiper	*Erolia melanotos*	Puviaqtuuq
Red phalarope	*Phalaropus fulicarius*	Auksruaq
Red-necked phalarope	*Phalaropus lobatus*	—

Table E–1. Common, scientific and Iñupiaq names of species listed in this document

Common name	Scientific name	Iñupiaq name[1]
Ruddy turnstone	*Arenaria interpres*	Tullignaq
Semipalmated sandpiper	*Ereunetes pusillus*	Livilivillakpak
Stilt sandpiper	*Micropalama griseus*	—
Raptors		
Bald eagle	*Haliaeetus leucocephalus*	Tifmiaqpak
Gyrfalcon	*Falco rusticolus*	—
Northern harrier	*Circus cyaneus*	Papiktuuq
Peregrine falcon	*Falco peregrinus*	Kirgavik
Rough-legged hawk	*Buteo lagapus*	Qixbiq
Short-eared owl	*Asio flammeus*	Nipaiouktaq/nipaixuktaq
Snowy owl	*Nyctea scandiaca*	Ukpik
Ptarmigan		
Willow ptamigan	*Lagopus lagopus*	—
Rock ptarmigan	*Lagopus mutus*	Niqsaaqtufiq
Passerine		
Common raven	*Corvus corax*	Tulugaq
Lapand longspur	*Calcarius lapponicus*	Qupajuk/putukiijuk
Redpoll	*Acanthis* spp.	Saqsakiq
Savannah sparrow	*Passerculus sandwichensis*	Aanaruie suliuqpa
Snow bunting	*Plectrophenax nivalis*	Amautligaq/avatalibuuvaq/ amautlikkauraq/amaujigaaluk
MAMMALS		
Large Mammals		
Arctic fox	*Alopex lagopus*	Qusrhaaq/tibiganniaq/qujhaaq
Caribou	*Rangifer tarandus*	Tuttu
Dall sheep	*Ovis dalli dalli*	Imnaiq/ipnaiq
Gray wolf	*Canis lupus*	Amabuq
Grizzly (brown) bear	*Ursus arctos*	Akjaq
Lynx	*Lynx canadensis*	Niutuuyiq/niutuiyiq/nuutuuyiq
Moose	*Alces alces*	Tiniikaq/tuttuvak/tiniika
Muskox	*Ovibos moschatus*	Umifmak/imummak
Red fox	*Vulpes vulpes*	Kavviaq/kayuqtuq
Wolverine	*Gulo gulo*	Qavvik/qapvik
Small Mammals		
Arctic ground squirrel	*Spermophilus parryii*	Siksrik
Barrenground shrew	*Sorex ugyunak*	—
Brown lemming	*Lemmus trimucronatus*	Aviffaq

Table E–1. Common, scientific and Iñupiaq names of species listed in this document

Common name	Scientific name	Iñupiaq name[1]
Collared lemming	*Dicrostonyx groenlandicus*	Qixafmiutauraq
Ermine (short-tailed weasel)	*Mustela erminea*	Itibiaq/tibiaq
Least weasel	*Mustela nivalis*	—
Northern red-backed vole	*Clethrionomys rutilus*	—
Singing vole	*Microtus miurus*	Avieeaq
Snowshoe hare	*Lepus americanus*	Ukalliuraq/ukalliq
Tundra shrew	*Sorex tundrensis*	Ugrufnaq
Tundra vole	*Microtus oeconomus*	Avieeaq
Other mammals		
Coyote	*Canis latrans*	Amabuuraq
Mink	*Mustela vison*	Tibiaqpak
Porcupine	*Erethizon dorsatum*	Ixuqutaq/qifabluk
River otter	*Lutra canadensis*	Pamiuqtuuq
Marine mammals		
Bearded seal	*Erignathus barbatus*	Ugruk
Beluga whale	*Delphinapterus leucas*	Sisuaq/kilalugak
Bowhead whale	*Balaena mysticetus*	Abviq
Polar bear	*Ursus maritimus*	Nanuq
Ringed seal	*Phoca hispida*	Qaibulik/qaibutlik
Spotted seal	*Phoca largha*	Qasigiaq

1. Iñupiaq names from website edition of Iñupiat Eskimo Dictionary: [http://www.alaskool.org/language/dictionaries/inupiaq/dictionary.htm; accessed on April 22, 2004].
2. Have some components of their populations that remain in fresh water year-round.
3. Principal (most commonly caught) coastal fish only.

Appendix F:
BLM Sensitive Species List for Alaska

Appendix F: BLM Sensitive Species List for Alaska

Table F–1. Scientific and common names of BLM Sensitive Species in Alaska

BLM-Alaska sensitive animals

	Scientific name	Common name
Birds	*Gavia adamsii*	Yellow-billed loon*
	Cygnus buccinator	Trumpeter swan
	Chen canagica	Emperor goose
	Branta canadensis occidentalis	Dusky Canada goose
	Aquila chrysaetos	Golden eagle
	Numenius tahitiensis	Bristle-thighed curlew
	Calidris canutus	Red knot
	Calidris ptilocnemis tschuktschor	Bering Sea rock sandpiper
	Brachyramphus brevirostris	Kittlitz's murrelet
	Brachyramphus marmoratus	Marbled murrelet
	Asio flammeus	Short-eared Owl
	Contopus cooperi	Olive-sided flycatcher
	Dendroica striata	Blackpoll warbler
	Euphagus carolinus	Rusty blackbird
	Plectrophenax hyperboreus	McKay's bunting
Mammals	*Lepus othus*	Alaskan hare
	Spermophilus parryii osgoodi	Osgood's arctic ground squirrel
	Sorex yukonicus	Alaskan tiny shrew
	Mustela americana kenaiensis	Kenai marten
	Odobenus rosmarus divergens	Pacific walrus*
	Erignathus barbatus	Bearded seal*
	Phoca hispida hispida	Ringed seal*
Fish	*Lampetra alaskensis*	Alaskan brook lamprey
	Salvelinus alpinus	Arctic char (Kigluaik Mountains)
Insects	*Acentrella feropagus*	A mayfly
	Rhithrogena ingalik	Alaska endemic mayfly
	Alaskaperla ovibovis	Alaska Sallfly

BLM-Alaska sensitive plants

Scientific name	Common name
Antennaria densifolia	
Arnica lonchophylla	Northern arnica
Artemisia globularia ssp. *lutea*	
Artemisia laciniata	Siberian wormwood
Artemisia senjavinensis	Arctic sage
Aster pygmaeus (Eurybia pygmaea)	Pygmy aster
Botrychium ascendens	Moonwort
Carex adelostoma	Circumpolar sedge
Claytonia arctica	Arctic springbeauty

Table F–1. Scientific and common names of BLM Sensitive Species in Alaska

Claytonia ogilviensis	Ogilvie Mountains spring beauty
Cryptantha shackletteana	Shacklettes' catseye
Douglasia alaskana	Alaska rock-jasmine
Douglasia arctica	Mackenzie River Douglasia
Douglasia beringensis	Arctic dwarf primrose
Draba micropetala	Alpine Whitlow-grass
Draba murrayi	Murray's Whitlow-grass
Draba ogilviensis	
Draba pauciflora	Adam's Whitlow-grass
Erigeron muirii	Muir's fleabane
Erigeron yukonensis	
Eriogonum flavum var. *aquilinum*	Yukon wild-buckwheat
Erysimum asperum var. *angustatum*	A wallflower
Gentianopsis detonsa ssp. *detonsa*	Sheared gentian
Koeleria asiatica	Oriental Junegrass
Lesquerella calderi	Calder's bladderpod
Mertensia drummondii	Drummond's bluebell
Montia bostockii	Bostock's miner's-lettuce
Oxytropis arctica var. *barnebyana*	Barneby's locoweed
Oxytropis huddelsonii	
Oxytropis kobukensis	Kobuk locoweed
Papaver alboroseum	Pale poppy
Papaver gorodkovii	
Papaver walpolei	Walpole poppy
Parrya nauruaq	
Pedicularis hirsuta	
Phacelia mollis	Macbride phacelia
Pleuropogon sabinei	Sabine-grass
Poa hartzii ssp. *alaskana*	
Poa porsildii	
Potentilla stipularis	Circumpolar cinquefoil
Primula tschuktschorum	Chukchi primrose
Puccinellia wrightii	
Ranunculus camissonis	
Ranunculus glacialis var. *L*	
Ranunculus turneri	Turner's butter-cup
Rumex graminifolius	
Rumex krausei	Cape Krause sorrel
Smelowskia johnsonii	
Smelowskia pyriformis	
Trisetum sibiricum ssp. *litorale*	Siberian false-oats

* Species that have been designated as candidate or proposed for listing under the Endangered Species Act. These species are automatically included on the BLM-Alaska Sensitive Species list at least until the candidate or proposed status is removed.

Appendix G:

Information, Models, and the Assumptions Used to Analyze the Effects of Oil and Saline Spills and Gas Releases

Appendix G: Information, Models, and the Assumptions Used to Analyze the Effects of Oil and Saline Spills and Gas Releases

This IAP/EIS analyzes oil and saline spills and gas releases, and their potential impacts to environmental, economic, and sociocultural resources and resource areas, which could result from oil exploration and development and production in the National Petroleum Reserve – Alaska (NPR-A). Estimating a future oil or saline spill or gas release is an exercise in probability. There is uncertainty associated with the location, timing, number, and volume of spills or releases, the chemical and physical properties of the spill or release, and the environmental conditions at the time of a spill or release. Although some of the uncertainty reflects imperfect data, there is also a considerable amount of uncertainty involved in estimating accidental spills and releases 15 to 90 years into the future. Section G1 and G2 discuss oil and saline spills, section G3 discusses gas releases and section G3 discusses the cumulative analysis.

This first section explains the data, methods, and results of an analysis of historical crude oil, refined product ("product")and saline spills for the Alaska North Slope, including wells, facilities and other pipelines up to (but not including) Pump Station 1 (PS-1). PS-1 marks the beginning of the Trans-Alaska Pipeline System and is included in the Trans-Alaska Pipeline analysis. The purpose of this spill analysis is to estimate the potential spill rates. The rates are used to estimate the potential crude, refined oil and saline spills. The spill estimates are then used to analyze the direct and indirect environmental impacts of the exploration and development and production within NPR-A.

The spill rate estimation method is based on statistical models used by the Bureau of Ocean Energy Management for Alaska North Slope and other oilfields. The data used for this analysis include historical Alaska North Slope crude and refined oil spills. The basic assumption is that the likelihood of future crude and refined oil and saline spills associated with the NPR-A exploration and production and development can be estimated from prior Alaska North Slope experience. It is assumed that spill rates (per billion barrels produced) for NPR-A will be similar to those at other Alaska North Slope facilities.

Estimates about oil and saline spills are used to create a scenario to analyze their effects to environmental, economic, and sociocultural resources and resource areas. These estimates pertain to the type of spill, the source of a spill, the general location and size of a spill, the chemistry of the oil, how the oil will weather, how long the oil will remain, and where the oil will go. Project-specific information, statistical analysis, and professional judgment support these assumptions. Based on these estimates, a scenario is created to reflect the spill information used for analysis, and the effects of such spills are analyzed. These steps constitute a "what if a spill occurs" analysis.

This spill analysis considers the entire exploration and development/production life of the NPR-A area, and assumes that commercial quantities of hydrocarbons are present in the planning area and that these hydrocarbons will be developed and produced at the estimated resource levels presented in the IAP/EIS. Uncertainties exist, such as 1) the actual resource levels, 2) the actual size of a crude, refined oil spill or saline spill, 3) the approximate location of oil assumed to be produced, and 4) whether production would occur at all. If no hydrocarbons exist, there is no chance of a crude oil or saline spill occurring in the planning area.

G.1 Oil and Saline Spill Size Categories

This IAP/EIS analyzes what is likely to happen in the future, using estimates about the likely size, duration, and type of a spill to analyze the effects. To estimate these parameters, spills are divided into three types: crude oil, refined oil and saline spills. Crude oil spills are divided into three size categories: small, large, and very large. Within each of these categories, generalized and specific estimates are made. Refined oil spills fall into the small spill size category. Saline spills are analyzed for large spills.

Small spills are defined as those less than 500 barrels (bbl; 1 bbl = 42 gallons); large spills are greater than or equal to 500 bbl or 1,000 bbl (depending upon the data source); and very large spills are greater than or equal to 120,000 bbl. Table G-1 shows the assumed source of a spill(s), type of fluid, size of spill(s) in bbl, and the receiving environment that is assumed in the analysis of the effects of oil spills in this IAP. The effects of spill(s) are analyzed in Chapter 4 (Environmental Consequences; Volumes 2 and 3). The following sections discuss the oil and saline spill analysis, and the assumptions used for effects analysis, for each of these three size categories.

Table G–1. Spill scenario for the alternatives

Source of spill	Type of oil	Size of spill (bbl)	Assumed number of spills under each alternative				Receiving environment
			A	B	C	D	
Small oil spills (< 500 bbl) onshore or NPR-A offshore waters							
Operational spills from all sources	Crude	3	135	94	132	142	Ice, tundra, snow, gravel pad, and water
	Refined	0.8	390	273	382	411	
Large oil spills (≥ 500 bbl) onshore or NPR-A offshore waters							
Pipeline	Crude	5,100	1	1	1	1	Ice, tundra, snow, gravel pad, and water
Facility/ Storage Tank/ gravel pad	Crude	900					
All	Saline	1,900	1	1	1	1	
Very large oil spills (≥ 120,000 bbl) onshore or NPR-A offshore waters							
Well control incident/long duration flow	Crude	120,000	NA	NA	NA	NA	Ice, tundra, snow, gravel pad, and water

G.1.1 Large Crude Oil Spills- Greater Than or Equal to 500 Barrels

Large spills are defined as greater than or equal to 500 barrels for the Alaska North Slope onshore and state waters and Trans-Alaska Pipeline System and greater than or equal to 1,000 bbl for the Outer Continental Shelf. Historical information about previous large spills on the Alaska North Slope and from the Trans-Alaska Pipeline System was used to estimate the hypothetical size of large spills and the rate at which such large spills would be estimated to occur in the future from leasing, exploration and development and production within NPR-A.

G.1.1.1 Historical Large Crude Oil Spill Sizes

Large spills are defined as greater than or equal to 500 barrels for the Alaska North Slope onshore and state waters and the Trans-Alaska Pipeline System. Historical information about large spills oil and gas condensate spills on the Alaska North Slope and from the Trans-Alaska Pipeline System was used to estimate the hypothetical size of large spills. Large spill occurrence rates in terms of number of spills per billion barrels produced were also estimated. Estimates for large spills from production in the NPR-A area are based on the historic large spill rates and sizes from onshore Alaska North Slope oil industry spills from 1985 to 2010 for large crude oil spills, and the Trans-Alaska Pipeline System pipeline spills from 1977 to 2010.

Historical Alaska North Slope Crude Oil Spills (Greater Than or Equal to 500 Barrels)

The Alaska North Slope large oil spill analysis includes onshore oil and gas exploration and development spills from the Point Thomson Unit, Badami Unit, Kuparuk River Unit, Milne Point Unit, Prudhoe Bay West Operating Area, Prudhoe Bay East Operating Area, Colville River, Bear Tooth, Greater Mooses Tooth and offshore Duck Island Unit (Endicott), Oooguruk, Nakaitchuq and Northstar Unit. Alaska North Slope spill data include large spills from onshore pipelines and offshore state waters and onshore production and gathering facilities. The following information does not include spills on the Alaska North Slope from the Trans-Alaska Pipeline System, which were evaluated separately.

For the Alaska North Slope, all available information on historic industry oil spills greater than or equal to 100 barrels during the period 1968 through 2000 was obtained from industry and regulatory agencies and collated (Hart Crowser, Inc. 2000). The USDOI Minerals Management Service (now Bureau of Ocean Energy Management) and Hart Crowser, Inc. collected data for crude oil spills for the U.S. Beaufort Sea, the NPR-A, and Onshore Alaska North Slope east of the NPR-A from the oil and gas industry, State of Alaska, Department of Environmental Conservation, USDOI, BLM and Minerals Management Service, Alyeska Pipeline Services Co., Joint Pipeline Office and Oil Spill Intelligence report.

A review of the reliability and completeness of the data for spills greater than or equal to 500 bbl (Hart Crowser, Inc. 2000) indicated that the available information was most reliable starting in1985 for crude oil spills on the Alaska North Slope, based on written documentation or lack of documentation for spills before that period. The Bureau of Ocean Energy Management determined that spills greater than or equal to 100 barrels were documented and included in the database since 1985. In 1985, the Alaska Department of Environmental Conservation began tracking spills in an electronic format. Although Hart Crowser, Inc. (2000) states that the database is complete for the years since production began, the BLM prefers to use 1985 as the starting point of reliability for large spills and 1989 for small spills

Analysis of the spill databases indicates that there are fewer spill records per year in the early years of Alaska North Slope production (Everest Consulting Associates 2007). The average number of spills reported from 1977 to 1984 was 100 per year. The average number of spills reported from 1985 to 2006 was 324 spills per year—greater by a factor of three. Any uncertainty in documenting spills before that time is a concern because it is typical for spills to occur more frequently during field and pipeline startup.

Eight crude oil spills greater than or equal to 500 barrels associated with onshore and nearshore Alaska North Slope oil production occurred from 1985 to 2010 (Table G-2). One spill greater than or equal to 1,000 barrels was documented during this time period. Of the eight spills, three are classified as a pipeline spill. Four are classified as production processing and one as a production well site. These five spills collectively are called facility spills.

Table G–2. Alaska North Slope facility and pipeline crude oil spills 1985-2010 (greater than or equal to 500 barrels)

Spill date	Facility type	Facility operator	Oil type	Spill location	Spill cause	Low spill quantity (barrels)	High spill quantity (barrels)
28-Jul-89	Production Processing	Conoco, Inc.	Crude Oil	Milne Point Unit, Central Processing Facility	Facility Tank Leak–overfill	825	925
25-Aug-89	Pipeline	ARCO Alaska, Inc.	Crude Oil	Kuparuk River Unit, Drill Site 2-U	Pipeline Leak–corrosion of block valve	340[2]	603[2]
10-Dec-90	Production Well Site	ARCO Alaska, Inc.	Crude Oil	Lisburne Unit, Drill Site L-5	Facility Explosion	176[1]	600[1]
17-Aug-93	Production Processing	ARCO Alaska, Inc.	Crude Oil/ Produced Water	Kuparuk River Unit CPF 1	Tank Leak–Corrosion		675
26-Sep-93	Production Processing	BP Exploration (Alaska)	Crude Oil	Prudhoe Bay Unit, Gathering Center 2	Facility Tank Leak– overflow due to pump failure		650
21-Aug-00	Production Processing	BP Exploration (Alaska)	Crude Oil/ Produced Water	Prudhoe Bay Unit, Gathering Center 2	Facility Tank Leak– overflow due to control system failure	700	715[4]
19-Feb 01	Pipeline	BP Exploration (Alaska)	Crude Oil/	West Prudhoe Bay, between D-pad and gathering center	Pipeline Leak – Line Failure, Human Error	225[4]	608.33[2]
02-Mar-06	Pipeline	BP Exploration (Alaska)		Prudhoe Bay Unit, GC-2 34" Oil Transit Line	Pipeline Leak - Corrosion		5053.62[3]

Sources: 1. Hart Crowser (2000); 2. Alaska Department of Environmental Conservation; 3. Unified Command ;4. BPXA

Using the highest reported spill-quantity values, from 1985 to 2010, the median spill size for facilities and pipeline greater than or equal to 500 barrels on the Alaska North Slope was 663 barrels, and the mean (or average) was 1,229 barrels. For purposes of analysis, the BLM uses the largest spill sizes of record. The largest facility spill on record is 925 barrels. The largest pipeline spill is 5,053 barrels. Rounded to the nearest 100 barrels (to reflect the uncertainty associated with spill estimates), the hypothetical spill sizes used for purposes of analysis are 900 barrels for the facility spill and 5,100 barrels for the pipeline spill.

Historical Trans-Alaska Pipeline Crude Oil Spills (Greater Than or Equal to 500 Barrels)

Private industry provides oil-spill information to the State Department of Environmental Conservation according to the State of Alaska Regulations (18 AAC 75) and the U.S. Department of Transportation according to 49 CFR 195.50 (Reporting Accidents). The Trans-Alaska Pipeline spill data were compiled by Hart Crowser, Inc. (2000) Maxim and Niebo (2002) and National Research Council (2003). The oil-spill data were collated and evaluated for completeness and comprehensiveness. The Alaska Department of Environmental Conservation, U.S. Department of Transportation, and Alyeska spill data reports were used to update the Trans-Alaska Pipeline crude large oil spill data to 2010.

The Trans-Alaska Pipeline spill data include the pipeline from the Alaska North Slope to the Valdez marine terminal. It does not include oil spills at the marine terminal. The Trans-Alaska Pipeline oil-spill analysis includes the pipeline and the pump stations, but excludes the Valdez marine terminal. Nine crude oil spills greater than or equal to 500 barrels associated with the Trans-Alaska Pipeline System occurred from 1977 through 2010 (Table G-3). Most large crude oil spills were associated with the start-up of the pipeline. No large spills greater than or equal to 1,000 barrels occurred from 1981 to October 2001; a period of 20 years. The mean (average) size crude oil spill greater than or equal to 500 barrels from 1977 to 2001 is 5,141 barrels, and the median is 4,000 barrels. For spill analysis, the median spill quantity is used and rounded to the nearest 100. Therefore, the median hypothetical Trans-Alaska Pipeline System pipeline spill size is 4,000 barrels for the cumulative oil spill analysis.

Historical and Statistical Alaska North Slope Blowout Information

The record for Alaska North Slope well control incidents is not validated, but is presented as the best available information. There are three written reports regarding well control incidents or blowouts on the Alaska North Slope: Mallory (1998), Fairweather (2000) and National Research Council (2003). Fairweather (2000) found 10 blowouts—six that Mallory had identified for the period 1974 to 1998 and four that occurred before 1974.

On February 15, 2012 Repsol had a loss of well control from an exploration well on the Qugruk #2 pad (Q2 pad), on the Colville River Delta, approximately 18 miles northeast of Nuiqsut and approximately 150 miles southeast of Barrow (70° 27’ 19” N, 150° 44’ 52” W). The loss of well control from a shallow gas pocket released an unknown quantity of gas and approximately 42,000 gallons (1,000 bbls) of drilling mud. The well ceased flowing on February 16, 2012.

Of the 11 blowouts, 10 were gas and 1 was oil. The 1950 oil blowout was unspectacular and could not have been avoided, as there were no casings or blowout preventers available (Fairweather 2000). Drilling practices from 1950 would not be relevant today.

A third study confirmed that no crude oil spills greater than or equal to 100 bbl from blowouts occurred from 1985 through 1999 (Hart Crowser, Inc. 2000). A report titled Blowout Frequency Assessment of Northstar (Scandpower AS 2001) uses statistical blowout frequencies modified to reflect specific field conditions and operative systems at Northstar. This report concludes that the blowout frequency for drilling in the oil-bearing zone at Northstar is 1.5×10^{-5} per well drilled. In comparison, the average statistical blowout frequency for a development well in the North Sea and U.S. Gulf of Mexico is 7.4×10^{-5} per well. This same report estimates that the statistical frequency of a blowout spill with a size greater than 130,000 barrels is 9.4×10^{-5} per well drilled for Northstar.

Table G–3. The Trans-Alaska Pipeline crude oil spills 1977-2010 (greater than or equal to 500 barrels)

Spill date	Facility type	Facility operator	Spill name	Spill location	Spill cause	Low spill quantity (barrels)	High spill quantity (barrels)	Quantity used in analysis
08-Jul-77	Pipeline Pump Station	Alyeska Pipeline Service Co.	Pump Station 8	TAPS PS 8 (TAPS MP 489.2)	Facility Explosion [a,b, c] Unspecified [e]	300 [b]	4,762 [b] 300 [a,c,e]	4,762 [b]
19-Jul-77	Pipeline	Alyeska Pipeline Service Co.	Check Valve 7	TAPS MP 26 (Check Valve 7)	Pipeline Leak - equipment damage [a,b, c] Human Error [e]	1000 [a,b]	1,800 [a] 1,000 [c,e] 2,620 [2]	1,800 [a]
15-Feb-78	Pipeline	Alyeska Pipeline Service Co.	Steele Creek	TAPS MP 457	Pipeline Leak - intentional sabotage [a,c] Unspecified [5]	11,905 [a]	16,000 [a] 11,905 [c,e]	16,000 [a]
10-Jun-79	Pipeline	Alyeska Pipeline Service Co.	Atigun Pass	TAPS MP 166 (N. side of Atigun Pass)	Pipeline Leak - line break [a,b,c,e]	1,500 [b]	7,143 [b] 1,500 [a,e] 5,267 [c]	7,143 [b]
15-Jun-79	Pipeline	Alyeska Pipeline Service Co.	Little Tonsina	TAPS MP 734	Pipeline Leak - line break [a,b,c,e]	300 [b]	4000 [a,b] 300 [c,e]	4,000 [a,b]
01-Jan-81	Pipeline	Alyeska Pipeline Service Co.	Check Valve 23	TAPS MP 114.6 (Check Valve 23)	Pipeline Leak - leaking valve	1,000 [b]	1,500 [a,c,d,e] 2,000 [f] 2,381 [b]	2,381 [b]
20-Apr-96	Pipeline	Alyeska Pipeline Service Co.	Check Valve 92	TAPS MP 539.7 (Check Valve 92)	Pipeline Leak - loose fitting	800 [a,b]	811 [a]	811 [a]
4-Oct-01	Pipeline	Alyeska Pipeline Service Co.		TAPS MP 400	Pipeline Leak -intentional sabotage - bullet hole	6,800	6,800	6,800
12-May-10	Tank	Alyeska Pipeline Service Co.	Pump Station 9, Tank 190		Tank Leak - Circuit Failure Valve Control	NA	2580 [a,b]	2580 [a,b]

Sources: a. Alyeska Pipeline Service Company; b. Alaska Department of Environmental Conservation; c. Unknown; d. Bureau of Land Management; e. Joint Pipeline Office; f. Oil Spill Intelligence Report

However unlikely a well control incident resulting in a long duration flow may be, it is an important concern to the public; therefore, the effects of a 120,000 barrels (15-day) spill are analyzed in section 4.12 in Volume 4 ("Low Probability, Very Large Oil Spill").

G.1.1.2 Historical Alaska North Slope and Trans Alaska Pipeline Large Crude Oil Spill Rates

To use historical Alaska North Slope industry spill records to successfully estimate the chance of one or more large oil spills occurring, there must be a properly developed and validated database. Ideally, the database should include a wide range of spill volumes over a long period of time from oil exploration and production resembling the prospective project.

The record of Alaska North Slope onshore and state waters large crude oil spills from 1985–2010 represents a long time period and the record of large spills have been validated through several past and ongoing studies (Hart Crowser 2000, Maxim and Niebo 2002, National Research Council 2003, Everest Consulting 2006, Nuka 2010).

In addition to a properly developed and validated database, the computation of an oil-spill rate requires an exposure variable. The purpose of an exposure variable is to balance equally different oil developments that should have similar oil spill frequencies for a given size of spills. Such an exposure variable is required, because oil developments rarely exactly resemble one other. Two basic criteria for the selection of an exposure variable are: (1) it should be defined simply; and (2) it should be a quantity readily estimated. The verification of a potential exposure variable includes a demonstration that the exposure variable generates equal values, in a statistical sense, for oil developments with similar oil-spill histories.

For oil spills, numerous such variables are in use, including historic volumes of oil produced/transported, number of wells drilled, well-years, and pipeline mile-years. Each of these exposure variables has an assigned application; for example, "wells drilled" would be used to compute the chance of a well control incident during drilling operations. Moreover, two different variables may be used for computing the spill rate from the same segment of an oil development; for example, both historic volumes of oil produced/transported, and pipeline mile-years are used to estimate the spill rate from the same pipeline. For this analysis, the exposure variable of volume of oil produced and pipeline mile year were calculated. For purposes of analysis, volume of oil produced was used to estimate the large spill rate.

Alaska North Slope Production		**Trans-Alaska Pipeline Mileage**	
1977-2010	16.28 billion barrels	1977-2010	26,838 pipeline mile years
1985-2010	12.40 billion barrels	1985-2010	20,808 pipeline mile years

Alaska North Slope Large Crude Oil Spill Rate 1985-2010 Based on Volume

Since 1985, one Alaska North Slope facility or pipeline spill greater than or equal to 1,000 barrels from Alaska North Slope production has occurred. No documentation for crude oil spills greater than or equal to 100 barrels occurring prior to 1985 was found, but spill records dated prior to 1985 have not been validated as complete because of missing or incomplete documentation (Hart Crowser 2000).

As noted above, eight large spills are documented from 1985 to 2010. For that same time period the total Alaska North Slope production was 12.40 billion barrels of crude oil and condensate (Alyeska Pipeline Service Company 2011). The Alaska North Slope spill rates for crude oil spills greater than or equal to 500 barrels from 1985-2010 are:

- 0.65 total spills per billion barrels of oil produced,
- 0.41 facility spills per billion barrels of oil produced, and
- 0.24 pipeline spills per billion barrels of oil produced.

Trans-Alaska Pipeline Large Crude Oil Spill Rate 1977-2010 and 1985-2010 Based on Volume and Pipeline-Mile-Year

Flow in the Trans-Alaska Pipeline System began on June 20, 1977, with throughput of 112 million barrels by the end of 1977. Throughput increased to almost 400 million barrels in 1978, peaked at 744 million barrels in 1988, and was 226 million barrels in 2010. The estimated total volume transported through the Trans-Alaska Pipeline System during the period 1977 through 2010 is 16.28 billion barrels condensate (Alyeska Pipeline Service Company 2011). The Trans-Alaska Pipeline System is 800.302 miles long.

1977-2010

There have been nine crude oil spills greater than or equal to 500 barrels attributed to Trans-Alaska Pipeline System operation, eight of which were greater than or equal to 1,000 barrels. The last spill greater than or equal to 1,000 barrels occurred in 2010 at Pump Station 9. The spill rate of 0.55 spills for spills greater than or equal to 500 barrels of spills per billion barrels transported for Trans-Alaska Pipeline System pipeline was calculated based on the record of seven accidental and two sabotage spills over 16.28 billion barrels of production. The spill rate of 0.0003354 large spills per pipeline-mile-year for the Trans-Alaska Pipeline System was calculated based on the record of seven accidental and two sabotage spills over 26,638 pipeline-mile-years during the period 1977 through 2010.

1985-2010

There have been three crude oil spills greater than or equal to 500 barrels, of which two were greater than or equal to 1,000 barrels. The spill rate of 0.24 spills for spills greater than or equal to 500 barrels of spills per billion barrels transported for the Trans-Alaska Pipeline System was calculated based on the record of three accidental spills over 12.40 billion barrels of production. The spill rate of 0.0001442 large spills per pipeline-mile-year for the Trans-Alaska Pipeline System was calculated based on the record of two accidental and one sabotage spill over 20,808 pipeline-mile-years during the period 1985 through 2010.

G.1.1.3 Estimated Mean Number and Percent Chance of One or More Large Crude Oil Spills for the National Petroleum Reserve – Alaska

The mean number of large crude oil spills, estimated over the production life of the planning area for Alternative A, Alternative B-1, Alternative B-2, Alternative C, and Alternative D are shown in Table G-4. The mean number of large spills is derived from the projected resource volumes and the historic large crude spill rate for the Alaska North Slope. For each alternative, the estimated mean spill number is less than one. For purposes of analysis one large spill is assumed for each alternative and it could be either from a facility or a pipeline. The estimated spill size volumes are 900 barrels for a facility spill or 5,100 barrels for a pipeline spill.

The estimated mean number of large spills over the life of exploration and production (listed in Table G-4) is used to estimate the chance of one or more large spills occurring. The estimated chance of one or more large spills occurring ranges from 28 percent for Alternative B-1 to 39 percent for Alternative D over the entire life of production. The estimated chance of no large spills occurring ranges from 72 percent for Alternative B-1 to 61 percent for alternative D over the entire life. It is more likely that no large spills will occur than one or more over the exploration, development and production life of the NPR-A alternatives.

Table G–4. Large crude oil spills estimated over the exploration, development, and production life of the National Petroleum Reserve-Alaska

Alternative	Resources (Bbbl)	Spill rate (spills/Bbbl)	Assumed spill size (bbl)	Estimated mean number of spills[1]	Estimated total spill volume[2] (bbl)	Percent chance of one or more large spills occurring[3]
			Crude oil			
A	0.723	0.65	900/5,100	0.47	900 or 5,100	37
B-1	0.505	0.65	900/5,100	0.33	900 or 5,100	28
B-2	0.549	0.65	900/5,100	0.36	900 or 5,100	30
C	0.707	0.65	900/5,100	0.46	900 or 5,100	37
D	0.761	0.65	900/5,100	0.49	900 or 5,100	39

1. The estimated mean number of oil spills is based on the estimated resource volume multiplied by the large spill rate.
2. The estimated total spill volume is the total volume for all of the estimated spills for the given alternative and price of oil.
3. The estimated percent chance over the life of exploration, development and production.

G.1.1.4 Alaska North Slope Large Saline Spills 1995-2009 (Greater than or Equal to 500 barrels)

In 2010, an Alaska North Slope spill analysis focused on oil and gas industry spills (Nuka Research and Planning Group, 2010). The purpose of the study was to analyze spills and determine mitigation to reduce the frequency and severity of future oil spills from Alaska North Slope crude oil piping infrastructure. The analysis focused on the loss-of-integrity spills. Loss-of integrity spills were defined as a failure the leads to a reportable spill of any fluids in the production stream. Because it considered all fluids the results of this study are not directly comparable to the results of crude and refined oil spills discussed above. In general, the study indicated similar trends and patterns as discussed here. The study discussed process/produced and seawater spills (hereafter called saline spills) for the first time in detail in addition to focusing on pipeline crude spills.

Appendix D of the above report lists the summary of Alaska North Slope Loss-of –integrity spills greater than 10,000 gallons from July 1, 1995 through December 2009. With the exception of the GC-2 pipeline, which was a crude oil spill, all spills in Appendix D are saline spills (produced water, process water or seawater). The GC-2 pipeline spill is included in the analysis of crude oil spills and is not included here. There have been 6 saline spills greater than or equal to 500 barrels while producing 5.6 billion barrels from July 1, 1995-December 2009 (Table G-5). The estimated large saline spill rate is 1.1 saline spills/billion barrels produced. Using the six saline spills listed in Table G-5 greater than or equal to 500 barrels, the mean spill size for this time period is 2,363 barrels and the median is 1,850 barrels. For oil spill analysis the median spill size is used and rounded to the nearest 100. Therefore, the median hypothetical large saline spill is 1,900 barrels.

Nuka Research and Planning Group (2010) examined where spills occurred specifically for flowline and oil transmission pipelines from July 1995-December 2009. Flowlines and oil transmission pipelines traverse more area that is not on pad or on road. The results for flowline and oil pipeline spills indicate 35 percent by number spills on tundra and 65 percent on gravel pads. In terms of volume the trend reverses; 78.3 percent by volume spills on tundra and 21.7 percent spills on gravel pads. A total of 5.2 acres were impacted by all loss of integrity spills from July 1995-December 2009. For those spills reaching the tundra 82.1 percent by volume was to frozen tundra and 17.9 percent was to thawed tundra.

Table G–5. Alaska North Slope facility and pipeline saline spills 1995-2009 (greater than or equal to 500 barrels)

Spill date	Oil field	Regulatory category	Fluid spilled (gal)	Spill cause	High spill quantity (barrels)
19-Dec-06	Prudhoe Bay	Above Ground Storage Tank	Produced Water	Mechanical Failure	6,075
25-Dec-08	Kuparuk River	Facility Oil Piping	Produced Water	Corrosion	2,260
15-Apr-01	Kuparuk River	Flowline	Produced Water	External Corrosion	2,200
10-Jan-98	Kuparuk River	Flowline	Produced Water	Material Failure	1,500
3-Nov-08	Prudhoe Bay	Facility Oil Piping	Seawater	Internal Corrosion	1,467
8-Jun-04	Prudhoe Bay	Process Piping	Process Water	Valve or Seal Failure	675

Source: Nuka Research and Planning Group (2010), State of Alaska Department of Environmental Conservation (2011).

The mean number of large saline spills, estimated over the production life of the planning area for Alternatives A, B-1, B-2, C, and D are shown in Table G-6. The mean number of large saline spills is derived from the projected resource volumes and the historic large saline spill rate for the Alaska North Slope. For each alternative, the estimated mean spill number is less than one. For purposes of analysis one large saline spill is assumed for each alternative and it could be either from a process water, three phase flow or a seawater pipeline or a tank. The estimated spill size volume is 1,900 barrels for a pipeline or tank spill.

Table G–6. Large saline spills estimated over the exploration, development, and production life of the National Petroleum Reserve-Alaska

Alternative	Resources	Spill rate	Assumed spill size (bbl)	Mean number of spills	Assumed number of spills	Estimated volume in barrels
	(Bbbl)	(spills/Bbbl)				
			Crude oil			
A	0.723	1.1	1,900	0.80	1	1,900
B-1	0.505	1.1	1,900	0.56	1	1,900
B-2	0.549	1.1	1,900	0.60	1	1,900
C	0.707	1.1	1,900	0.78	1	1,900
D	0.761	1.1	1,900	0.84	1	1,900

bbl = barrels; Bbbl = billion barrels

G.1.2 Small Crude and Refined Oil Spills - Less Than 500 Barrels

Small oil spills are defined as spills that are less than 500 barrels for the onshore and state waters of the Alaska North Slope. The BLM considers two oil types for small spills: crude oil and refined oil. The BLM expects the same companies to participate onshore in the

National Petroleum Reserve-Alaska as those that are now operating on the onshore and state waters of the Alaska North Slope. The BLM expects similar but not exact environmental conditions. It is reasonable to assume that the small oil spill occurrence rate in the National Petroleum Reserve-Alaska will be similar to the small oil spill occurrence rate on the onshore and state waters of the Alaska North Slope.

Historical small oil spill information and simple statistical methods are used to derive the following information about small crude and refined oil spills that occur on the onshore Alaska North Slope:

- estimates of the number of small spills for every billion barrels of oil produced (oil-spill rates);
- estimates of the spill size distribution of small spills; and
- estimates of the mean and median size of small oil spills from facilities, pipelines, and flow lines combined.

The BLM uses this information to estimate the number, size and distribution of small spills that may occur from leasing and subsequent exploration and development in NPR-A. The analysis of small oil spills considers the entire exploration and development and production life and assumes: (1) commercial quantities of hydrocarbons are present and (2) these hydrocarbons will be developed and produced at the estimated resource levels.

The historical information consists of crude and refined oil spills reported to the Alaska Department of Environmental Conservation and the Joint Pipeline Office by the oil industry, their subcontractors and regulatory entities. Crude and refined oil spill rates and patterns from onshore Alaska North Slope and state waters oil and gas exploration and development activities are determined for spills less than one gallon and less than 500 barrels. Refined oil includes aviation fuel, diesel fuel, engine lubricants, fuel oil, gasoline, grease, hydraulic oil, transformer oil, and transmission oil. The onshore Alaska North Slope oil spill analysis includes onshore and offshore oil and gas exploration and development spills from the Point Thompson Unit, Badami Unit, Kuparuk River Unit, Milne Point Unit, Prudhoe Bay West Operating Area, Prudhoe Bay East Operating Area, Colville River, Bear Tooth, Greater Mooses Tooth and offshore Duck Island Unit (Endicott), Oooguruk, Nakaitchuq and Northstar Unit.

Oil spill information is provided to the Alaska Department of Environmental Conservation in accordance with State of Alaska Regulations (18 AAC § 75). The Alaska Department of Environmental Conservation figures are based on initial spill reports and may or may not contain updated information. Because of increased scrutiny after the Exxon Valdez oil spill, small oil spill, information in the Alaska Department of Environmental Conservation database is most reliable for 1989 and later. Even though the integrity of the database cannot be validated thoroughly, the information in the database is still valuable because it is the only publically available data on Alaska North Slope small spills. A simple analysis of small oil spills was performed, and small spill rates were estimated without regard to differentiating operation processes.

A total small spill rate of 727 spills per billion barrels produced, calculated from the Alaska North Slope record of small spills, is used here. This total small spill rate consists of 187 small crude oil spills per billion barrels and 540 small refined product spills per billion barrels produced as is discussed further below.

G.1.2.1 Historical Small Crude Oil Spill Rates and Patterns on the North Slope

The analysis of crude oil spills was performed collectively for all Alaska North Slope facilities, pipelines, and flow lines for the period 1989-2009. The pattern that emerged was one of numerous small crude oil spills. The number of small crude spills per year ranged from a minimum of 32 to a maximum of 228 and the total volumes ranged from about 40 to 793 barrels in any given year. Of the small crude oil spills that occurred between 1989 and 2009, the Alaska Department of Environmental Conservation database indicates that the majority of spills are less than 1 barrel:

- 16 percent were less than or equal to 1 gallon;
- 54 percent were less than or equal to 5 gallons;
- 82 percent were less than or equal to 1 barrel and
- 98.5 percent were less than 25 barrels.

As with all oil spill distributions; small spills are numerous and collectively add up to a small volume and a few of the small crude spills contribute the majority of the volume.

The individual small crude spill sizes in the database range from less than 1 gallon to 375 barrels. The mean small crude oil spill size on the Alaska North Slope is 2.8 barrels, and the median spill size is 5 gallons (Table G-7). For purposes of the oil spill analysis in this IAP/EIS, a mean small crude oil-spill volume of 3 barrels is assumed.

Table G–7. Small crude-oil spills: Estimated spill rates for the Alaska North Slope

Small crude-oil spills less than 500 barrels, 1989-2009	
Total Volume of Crude Spills	4,872 barrels
Total Number of Spills	1,754 spills
Mean (Average) Spill Size	2.8 barrels
Median Spill Size	5 gallons
Production (Crude Oil)	9.4 billion barrels
Spill Rate	187 spills/billion barrels of crude oil produced

Note: Oil-spill databases are from the Alaska Department of Environmental Conservation, Anchorage, Juneau, and Fairbanks. Alaska North Slope production data are derived from the Trans-Alaska Pipeline System throughput data from Alyeska Pipeline.

The Alaska Department of Environmental Conservation database indicates that the causes of small crude oil spills on the Alaska North Slope. Approximately 7 percent of small crude spills cause in the database are unknown. Causal factors, in decreasing order of frequency include:

- other; which includes individual details of the cause
- leaks
- human error
- seal failures
- unknown
- faulty valves/gauges
- vent discharges
- valve failure
- equipment failure
- faulty valves/gauges

The estimated small crude oil spill rate for the Alaska North Slope is 187 spills per billion barrels produced (Table G-7). The estimated mean number, size, and total volume of small crude spills for each of the alternatives are shown in Table G-8. For the small crude oil spill analysis, the estimated mean number of small spills is used as the assumed number of small spills.

Table G–8. Small crude oil spills estimated over the exploration, development, and production life of the National Petroleum Reserve-Alaska

Alternative	Resources (Bbbl)	Spill rate (spills/Bbbl)	Assumed spill size (bbl)	Estimated mean number of spills[1]	Estimated total spill volume (bbl)
A	0.723	187	3	135	405
B-1	0.505	187	3	94	282
B-2	0.549	187	3	103	309
C	0.707	187	3	132	396
D	0.761	187	3	142	426

bbl = barrels; Bbbl = billion barrels

1. The estimated mean number of small crude oil spills is estimated from the resource volume multiplied by the spill rate and is rounded to the nearest whole number.

G.1.2.2 Historical Small Refined Oil Spill Rates and Types of Spills on the North Slope

Typical refined products spilled on the Alaska North Slope are aviation fuel, diesel fuel, engine lube, fuel oil, gasoline, grease, hydraulic oil, transformer oil, and transmission oil. On the Alaska North Slope, diesel spills represent 52 percent of refined oil spills by frequency and 74 percent by volume. Engine lube oil spills are 11 percent by frequency and 5 percent by volume. Hydraulic oil spills are 32 percent by frequency and 13 percent by volume. Aviation fuel is 0.3 percent by frequency and 2 percent by volume. All other categories of refined spills are less than 1 percent by frequency and volume.

Small, refined oil spills occur in conjunction with oil exploration and production. From 1989 to 2009, the spill rate for small, refined oil spills was 540 spills per billion barrels produced (Table G-9). The estimated mean number, size, and total volume of small, refined spills for each of the alternatives are shown in Table G-10. For the small, refined oil spill analysis, the estimated mean number of small spills is used as the assumed number of small spills.

Table G–9. Small refined-oil spills: Estimated spill rates for the Alaska North Slope

Small refined-oil spills <500 barrels, 1989-2009	
Total Volume of Refined Spills	4, 226 barrels
Total Number of Spills	5,026 spills
Mean (Average) Spill Size	0.8
Median Spill Size	5 gallons
Production (Crude Oil)	9.4 billion barrels
Spill Rate	540 spills/billion barrels of crude oil produced

Note: Oil-spill databases are from the Alaska Department of Environmental Conservation, Anchorage, Juneau, and Fairbanks. Alaska North Slope production data are derived from the Trans-Alaska Pipeline System throughput data from Alyeska Pipeline.

Table G–10. Small refined oil spills less than 500 barrels estimated over the exploration, development, and production life of the National Petroleum Reserve-Alaska

Alternative	Resources (Bbbl)	Spill rate (Spills/Bbbl)	Assumed spill size (bbl)[1]	Estimated mean number of spills[2]	Estimated total spill volume (bbl)
A	0.723	540	0.8	390	312
B-1	0.505	540	0.8	273	218
B-2	0.549	540	0.8	296	237
C	0.707	540	0.8	382	306
D	0.761	540	0.8	411	329

bbl = barrels; Bbbl = billion barrels

1. The mean spill size for refined spills on the Alaska North Slope from 1989 through 2009; equivalent to 35 gallons.
2. The fractional estimated mean spill number and volume are rounded to the nearest whole number.

G.1.3 Very Large Oil Spill - Greater Than or Equal to 120,000 Barrels

Unexpected and accidental large spills are unlikely but could possibly result from NPR-A exploration or development operations involving facilities or pipelines. However, incidents with the greatest potential for severe consequences are losses of well control with uncontrolled releases of large volumes of oil, where primary and secondary barriers fail, the well does not bridge (bridging occurs when the wellbore collapses and seals the flow path), and the flow is of long duration (Holand 1997).

Very large spills happen very infrequently, and there are limited data for use in the BLM's statistical analysis and predictive efforts. In general, historical data show that loss of well control events resulting in oil spills are very infrequent and that those resulting in large accidental oil spills are even rarer events (Anderson and Labelle 2000; Anderson, Mayes, and LaBelle 2012; Bercha Group 2006, 2008; Izon et al. 2007). The Norwegian SINTEF Offshore Blowout Database, which tracks worldwide offshore oil and gas blowouts, where risk-comparable drilling operations are analyzed, supports the same conclusion (International Association of Oil & Gas Producers 2010). New Outer Continental Shelf drilling regulations and recent advances in containment technology may further reduce the frequency and size of oil spills from offshore operations. However, as the 2010 Deepwater Horizon event illustrated, there is a very small chance for very large spills to occur and result in unacceptable impacts, some of which have the potential to be catastrophic.

A fundamental challenge is to accurately describe this very small risk, especially since there have been relatively few large oil spills that can serve as benchmarks (Scarlett et al. 2011; USDOI, Bureau of Ocean Energy Management 2012; Section 4.2.2). Generally wells within NPR-A would be onshore or directionally drilled from shore to reach the nearshore waters or lagoons of NPR-A. Therefore, it was most relevant to consider historic onshore very large spills.

The frequency of a very large spill occurring is very low. Internationally, from 1965 through 2010, four onshore oil well control incidents, resulting in an oil spill of greater than or equal to 120,000 barrels, were identified from the peer reviewed and "gray" literature (Table G-11). The largest onshore blowout, called the Lakeview gusher, was estimated to be 9.4 million bbl, half of which was estimated to reach the environment or evaporate. The Lakeview gusher incident in 1910 in California is not considered in this analysis because drilling techniques have evolved substantially since it occurred.

There were roughly 1.066 trillion barrels of oil produced worldwide from 1965–2010 (British Petroleum 2011). The BLM uses worldwide production as an exposure variable because the number of exploration wells worldwide is not readily available. These data provide an approximate occurrence rate of about 1 very large oil spill from an onshore blowout worldwide for approximately every 270 billion barrels of oil produced worldwide. Using international data increases the size of the data set and is more likely to capture rare events. However, it assumes that non-U.S. events are relevant to U.S. events to the extent that technology, maintenance, operational standards, and other factors are equal; but this may not be the case.

Table G–11. Historical very large oil spills from onshore well control incidents 1910-2010

Name	Company	Spill source	Location	Oil	Begin	End	Duration	Billion barrels	Source
Lakeview Gusher	Lakeview Oil Company	Well	United States, Kern County, California	Crude	3/14 1910	9/ 1911	18 months	9,000,000	Anonymous, 2002
Well No. 5 Fergana Valley	Uzbekneft	Well	Uzbekistan, Fergana Valley, Mingulak oil field	Crude	3/2 1992		>4 weeks	2,095,238	OSIR, 1998, Fingas, 2000
Dubai		Dev. Well		Crude	1973			2,000,000	Gulf Canada Resources Inc, 1982
D-103	Occidental of Libya	Prod Well	Libya, near al Fuqaha	Crude	8/11 1980		5 months	1,000,000	Fingas, 2000
Ora B. Jones #3	Richey& Company In	Expl. Well	U.S. Ranger, Texas, Eastland Co.	Crude	11/6 1985	11/14 1985	8 days	326,000	Fingas, 2000, Quinal et al., 2005

Note: Cells with no data means the information is not readily available in the open literature.

Sources: Compiled from cited references

State of Alaska regulation 18 ACC 75.434 states that (1) the response planning standard for an exploration facility is 16,500 barrels (5,500 barrels of oil per day for 3 days), unless relevant well data, exploration data, and other supporting technical documentation provided to the department and to the Alaska Oil and Gas Conservation Commission demonstrates to the satisfaction of the department that a lower response planning standard volume is appropriate; and (2) an additional 5,500 barrels for each of 12 days beyond 72 hours, unless relevant well data, exploration data, and other supporting technical documentation provided to the department and to the Alaska Oil and Gas Conservation Commission demonstrates to the satisfaction of the department that a lower response planning standard volume is appropriate.

G.2 Oil Weathering and Spreading

Information about large crude oil spill weathering and the aerial extent of an oil spill in the National Petroleum Reserve-Alaska lagoon waters were estimated from the SINTEF oil weathering model and historical climatology information.

G.2.1 Modeling Simulations of Large Oil Weathering

To judge the effect of a large oil spill, the following volumes must be estimated:

- the amount of oil that evaporates;
- the amount of oil that naturally disperses; and
- the amount of oil that remains after a certain time period.

Alpine field crude oil was used as the analog of oil types in the planning area. Weathering estimates of Alpine field crude oil and Arctic diesel (over a 30-day period) were derived by the SINTEF Oil Weathering Model (OWM), Version 4.0 (Reed et al. 2004).

Individual weathering results for Alpine field crude oil spills from the SINTEF OWM model are shown in Table G-12 and Table G-13. The SINTEF OWM changes both oil properties (density, viscosity, pour point, flash point, and water content) and physical properties (spreading, evaporation, oil-in-water dispersion, and water uptake) of the oil. The OWM performs a 30-day time horizon on the model weathering calculations, but with a warning that the model is not verified against experimental field data for more than 4 to 5 days. The SINTEF OWM has been tested extensively with results from three full-scale field trials of experimental oil spills (Daling and Strom 1999). The SINTEF OWM does not incorporate the effects of: currents, beaching, containment, photo-oxidation, microbiological degradation, adsorption to particles or encapsulation by ice.

Table G–12. Fate and behavior of a hypothetical 5,100-barrel oil spill from lagoon pipelines[1]

Features	Summer spill[2]				Meltout spill[3]			
Time after spill in days	1	3	10	30	1	3	10	30
Oil remaining (percent)	65.8	55.3	36.3	13.0	68.8	61.3	48.6	56.3
Oil dispersed (percent)	4.8	11.3	26.8	47.5	0.2	0.6	1.4	3.4
Oil evaporated (percent)	29.4	33.4	36.9	39.5	28.5	32.5	36.7	40.3
Thickness (mm)	3.1	1.9	1.1	1.0	4.6	2.7	1.5	1.0
Discontinuous area (square miles)[4]	0.6	17.1	81.5	338.1	3.3	13.5	33.1	265.9
Estimated coastline oiled (mi)[5]	52				57			

1. Calculated with the SINTEF Oil Weathering Model Version 4.0 (Reed et al. 2004), assuming an Alpine field crude type.
2. Summer (July through September) and assumes: 12-knot wind speed, 33 degrees Fahrenheit, and 1.3-feet (0.4-meter) wave height.
3. Spill is assumed to occur in May into first-year ice, pools 0.8 inches (2 cm) thick on ice surface for 2 days at 32 degrees Fahrenheit before meltout into 50% ice cover, 11-knot wind speed, and 0.3 feet (0.1 meter) wave heights.
4. Calculated from Equation 6 of Table 2 in Ford (1985), and is the discontinuous area of a continuing spill or the area swept by an instantaneous spill of a given volume. Ice dispersion occurs for about 30 days before meltout.
5. Calculated from Equation 17 of Table 4 in Ford (1985), and is the result of stepwise multiple regression for length of historical coastline affected.

Table G–13. Fate and behavior of a hypothetical 900-barrel oil spill from a lagoon facility[1]

Features	Summer spill[2]				Meltout spill[3]			
Time after spill in days	1	3	10	30	1	3	10	30
Oil remaining (percent)	75.5	68.4	57.9	40	76.9	71.8	64	56.5
Oil dispersed (percent)	0.5	1.6	6.1	20	0.1	0.2	1	3.5
Oil evaporated (percent)	24	30	36	40	23	28	35	40
Thickness (mm)	4.1	2.5	1.5	1	6.1	3.9	1.9	1.2
Discontinuous area (square miles)[4]	0.6	4.3	21.1	86.8	1.2	5.6	26.7	112.2
Estimated coastline oiled (mi)[5]	13.6				13.0			

1. Calculated with the SINTEF Oil Weathering Model Version 4.0 (Reed et al. 2004), assuming an Alpine field crude type.
2. Summer (July through September) assumes: 12-knot wind speed, 33 degrees Fahrenheit, and 1.3-feet (0.4-meter) wave height.
3. Spill is assumed to occur in May into first-year ice, pools 0.8 inches (2 cm) thick on ice surface for 2 days at 32 degrees Fahrenheit before meltout into 50% ice cover, 11-knot wind speed, and 0.3 feet (0.1 meter) wave heights.
4. Calculated from Equation 6 of Table 2 in Ford (1985), and is the discontinuous area of a continuing spill or the area swept by an instantaneous spill of a given volume. Ice dispersion occurs for about 30 days before meltout.
5. Calculated from Equation 17 of Table 4 in Ford (1985), and is the result of stepwise multiple regression for length of historical coastline affected.

The spill sizes chosen for oil weathering were 5,100 and 900 bbl for the Alpine field-type crude oil spill. Two general scenarios were simulated—one in which oil spills into open water, and another in which oil freezes into the ice and melts into 50 percent ice cover. It was assumed that open water occurs July through September, and that a winter spill melts out in July. For open water, the weathering of the 5,100- and 900-bbl spills was modeled as instantaneous spills. For the meltout spill scenario, the entire spill volume was modeled as an instantaneous spill. Although different amounts of oil could melt out at different times, the BLM assumed a conservative approach; all oil was released at the same time. Results are reported for the end of 1, 3, 10, and 30 days. The assumed fate and behavior of Alpine field crude oil and diesel oil, information that was used in the analysis of the effects of oil on environmental and social resources, are summarized in Table G-12 and Table G-13.

G.2.2 Observations of Historic North Slope Oil Spill Patterns

The development scenarios for alternatives A, B-1, B-2, C, and D include an onshore pipeline. Of greatest concern would be the potential contamination of the Colville River, because a pipeline could cross or underlie the Colville River and some of its tributaries, and Teshekpuk Lake.

Most oil and gas industry spills on the Alaska North Slope are confined to gravel pads and roads, and fewer records show crude and refined oil spills contacting the tundra. The Alaska Department of Environmental Conservation spill database did not contain a field for spills specifically occurring on the tundra until 1995 (Behr-Andres et al. 2001, Conn et al. 2001). From July 1995 to March of 2001, 106 reports of crude and refined oil spills to tundra were reported (Conn et al. 2001). During that same time period approximately 1,270 reports of refined and crude oil spills were reported. Approximately 8.4 percent of the spills on the Alaska North Slope were to tundra during this time period. For purposes of this analysis, the BLM assumes 10 percent of the spills are to tundra and 90 percent are on roads and pads. Conn et al. (2001) further characterized the occurrence of tundra spills.

Winter occurs for 8 to 9 months of the year on the North Slope and their analysis indicated 82 percent of the spills occurred during snow cover, 18 percent occurred during summer months and most of the spills were to wet tundra.

Those spills reaching the surrounding environment generally remain restricted to a limited area of the tundra unless they reach a river, stream, or other water body. The Alaska Department of Environmental Conservation records of crude and refined oil spills are not accurate enough to provide statistical spill size areas. The following are comments based on information from the Alaska Department of Environmental Conservation database and Behr-Andres et al. (2001). Off-pad spills that occur in or reach the environment generally cover a small area (less than or equal to 500 square feet). Larger areas of contamination occur when wind blows a fine oil mist over a large area. The largest area ever covered was the result of a pipeline spill on December 30, 1993, at drill site 5, well 23, which misted a fine oil spray of 4 barrels over a tundra area of 100 to 145 acres (Mueller 1997). Crude oil from a failed flowline spilled onto a gravel pad, reserve pit, and impoundment. High winds resulted in the crude oil being misted over the snow-covered tundra in an area approximately 330 feet wide and 1,300 feet long (Behr-Andres et al. 2001). Of the off-pad spills that occur, many contact snow or ice, which is cleaned up before the oil reaches the tundra. Smaller spills are likely to be contained within the snow layer, depending on snow depth and density. Larger spills are more likely to reach the ground surface. The Alaska Department of Environmental Conservation database documents that a spill at Point McIntyre covered approximately 23 acres of snow-covered tundra with 142 barrels of crude oil. Because this area was snow covered, there was little impact to the surrounding environment. If this spill had occurred during the summer, the impacts would have been very different.

G.3 Natural Gas Releases

This analysis evaluates the potential for a large gas release during natural gas development and production, as well as the potential impacts of such releases on the environment. This analysis identifies three general types of potential releases: from loss of well control at production platforms, from ruptured or leaking pipelines, and from onshore facilities. The following subsections discuss possible ways in which natural gas may be released into the environment, assign frequencies to notable events, and present hypothetical release scenarios for further environmental resource-specific analysis.

G.3.1 Loss of Well Control - Gas

It is possible that a loss of well control during natural gas production could cause a release of natural gas into the environment. Loss of well control is estimated at 3.6 x 10-4 gas blowouts per exploration well and 7.0 x 10^{-4} blowouts per development well drilled by International Association of Oil & Gas Producers (2010). The production well control incident rate for production of both oil and gas is 5.7 x 10^{-5} blowouts per well year (International Association of Oil & Gas Producers 2010).

The well control incident rate during production is lower than either the exploration or development drilling phase. A comparison of offshore and onshore rates indicated that rates were within less than an order of magnitude, suggesting that operational well blowout rates are relatively constant from onshore to offshore environments and from primary production to enhanced recovery to gas storage.

During sales-gas production, it is estimated that one well control incident of a single well on the facility could occur, releasing 10 million cubic feet of natural gas for 1 day. This is based on the average well production for one day from one well and estimated rates of blowout duration for production wells.

G.3.2 Ruptured Pipeline

Although unlikely, there exists some potential for a gas pipeline to rupture. The estimated significant incident rate for generic DOT onshore gas transmission lines from 1990-2009 is 1.5×10^{-4} per pipeline mile-year. For a 300-mile onshore pipeline, over a 20-year production life, the estimated number of significant incidents using the Department of Transportation's estimated rate is 0.9 significant incidents over the life of the project. Under Department of Transportation regulation, significant incidents are incidents that involve property damage of more than $50,000, injury, death, release of gas, or that are otherwise considered significant by the operator. It should be noted that the major cause of Department of Transportation transmission and distribution pipeline accidents is damage by digging near existing pipelines. The lack of population and activity on the Alaska North Slope could likely reduce the historical frequency for this causal factor.

A major release of dry natural gas would cause a sudden decrease in gas pressure, which in turn would automatically initiate procedures to close the valves on both ends of the ruptured segment of pipeline. Closure of the valves would effectively isolate the rupture and limit the amount of natural gas released into the environment. Given the daily flow rate and the estimated total number of valves, it is estimated that approximately 20 million cubic feet could be released within one pipe section between two valves.

Onshore, from an elevated pipeline the gas would disperse into the atmosphere. Underground, from a buried pipeline release, the gas would bubble to the surface and continue into the atmosphere, where it would dissipate.

G.3.3 Onshore Facility

Although unlikely, due to the enclosed space, there exists some potential for a gas leak and explosion at the onshore facility. The greatest hazard as a result of a natural gas leak is a fire or explosion. Methane has an auto-ignition temperature of 1,000 degrees Fahrenheit and is flammable at concentrations between 5 to 15 percent in air. Unconfined mixtures of methane in air are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can result in a potential explosion hazard.

G.3.4 Natural Gas Release Fate

Natural gas is primarily made of up methane CH_4 and ethane C_2H_6 which make up 85-90 percent of the volume of the mixture. Propane, butane, and heavier hydrocarbons can be extracted from the gas system and liquefied for transportation and storage. These are commonly known as liquid petroleum gas. Pentane through decane are the intermediate-weight hydrocarbons and are volatile liquids at atmospheric temperature and pressure. The common names for these are pentanes-plus, condensate, natural gasoline, and natural gas liquids). Produced gas is expected to be dry gas (no water or condensates).

The primary component of natural gas is methane, a colorless, odorless, and tasteless gas. It is not toxic in the atmosphere, but is classified as a simple asphyxiate, possessing an inhalation hazard. As with all gases, if inhaled in high enough concentration, oxygen deficiency could occur and result in suffocation. The specific gravity of methane is 0.55 (Air = 1.0). Being lighter than ambient air, it has the tendency to rise and dissipate into the atmosphere.

G.4 Cumulative Analysis of Oil Spills

This section discusses how the large oil spills for Effects of the Cumulative Case (section 4.8.4 Cumulative Oil Spills in volume 3) were estimated.

G.4.1 Preparing the Cumulative Oil Spill Analysis

To estimate the assumed number of large oil spills for the analysis of cumulative effects, the BLM used a future production estimate and large spill occurrence rates. The production estimate includes past, present, and future production for the Alaska North Slope and Beaufort and Chukchi seas. For cumulative case analysis, estimates are made for past, present and future production for the Alaska North Slope and adjacent Outer Continental Shelf areas in the Beaufort and Chukchi seas (Table G-14). For purposes of analysis, the high end of the Outer Continental Shelf range was used for a total of 11.24 billion barrels. The estimates for past activities include remaining proven reserves in already developed fields. The estimates for present activities include proven and probable resources reported for discovered fields expected to be developed in the near future. The estimates for future activities are based on undiscovered resources that may become future commercial projects under favorable conditions. All of these scenarios are predicated on high oil/gas prices (above $60 and up to $160), stable tax policies, continued operation of key infrastructure (Trans-Alaska Pipeline System), and no regulatory impediments or legal delays. Estimates for future production are much more uncertain because the fields have not been discovered and the above economic factors cannot be guaranteed for decades into the future.

Table G–14. Future production of conventional oil used in the cumulative impact analysis, 2012-2100

Area	Oil (billion barrels)
NPR-A	0.76
Colville-Canning (includes State Beaufort Sea)	3.15
Chukchi Sea Outer Continental Shelf	1.5-6.23
Beaufort Sea Outer Continental Shelf	0.5-1.10
Total	5.91-11.24

Sources: Thomas et al. 2009, USDOI Bureau of Ocean Energy Management 2012.

Note: The estimates of economically recoverable oil for NPR-A is that estimated in this plan for Alternative D. For the other alternatives, corresponding oil estimates would be: Alternative A—0.723 billion barrels; Alternative B-1—.0.505 billion barrels; Alternative B-2—0.549 billion barrels; Alternative C—.0.707 billion barrels.

The Trans-Alaska Pipeline System pipeline, onshore Alaska North Slope, and the Outer Continental Shelf have varying large spill rates and spill-size categories. For a summary of the spill rates and spill size categories that were assumed for analysis of oil spills in the cumulative case, see Table G-15. One noteworthy fact is that most oil originating from either onshore or offshore on the North Slope of Alaska flows through the Trans-Alaska Pipeline System pipeline and into Trans-Alaska Pipeline System tankers.

Table G–15. Oil spill rates and spill-size categories used to estimate large crude oil spills for the cumulative analysis

	Arctic Outer Continental Shelf		Alaska North Slope 1985-2010		Trans-Alaska Pipeline System Pipeline 1977-2010	
Location	**Spill rate (spills/Bbbl)**	**Size category (bbl)**	**Spill rate (Spills/Bbbl)**	**Size category (bbl)**	**Spill rate (Spills/Bbbl)**	**Size category (bbl)**
Offshore	1.13	≥1,000	-	-		
Onshore	-	-	0.65	≥500	0.55	≥500

Bbbl = billion barrels; bbl = barrels

G.4.2 Estimating Possible Future Large Spills from All Sources

The estimated mean number and volume of large spills for the cumulative case are shown in Table G-16 (next page). The cumulative case estimates for oil spill analysis are discussed in section 4.8.4, Volume 4. The Bureau of Ocean Energy Management (2012; Table 4.6.1-4) estimated 2-8 Outer Continental Shelf large spills could occur in offshore Outer Continental Shelf water depending upon a price assumptions ranging from $60 to of $160 per barrel. For purposes of analysis BLM used the higher end of the estimated resource range at $160 and the associated higher number of estimated spills for purposes of analysis.

Table G–16. Cumulative oil-spill-occurrence estimates greater than or equal to 500 barrels and greater than or equal to 1,000 barrels out to 2100 of the National Petroleum Reserve-Alaska

Category	Large crude oil spills				
	Reserves and resources (Bbbl)	Spill rate [1] (spills/Bbbl)	Size category (bbl)	Assumed size (bbl) pipeline/facility [2]	Number of large spills
NPR-A					
Alternative A	0.723	0.65	≥500	5,100/900	1
Alternative B-1	0.505	0.65	≥500	5,100/900	1
Alternative B-2	0.549	0.65	≥500	5,100/900	1
Alternative C	0.707	0.65	≥500	5,100/900	1
Alternative D [3]	0.761	0.65	≥500	5,100/900	1
Colville Canning/State Beaufort Sea					
	3.15	0.65	≥500	700/700	2
Arctic Outer Continental Shelf (Beaufort and Chukchi Sea)					
Total	2.00-7.325 [a]	1.13 [b]	≥1,000	1,700/5,100	2-8 [c]
Trans-Alaska Pipeline System					
	5.91 - 11.24 [a]	0.55	≥500	4,000/na	3-6 [d]
Total [1]					
	5.91 - 11.24 [a]	-	-	-	8-17

Bbbl = billion barrels; bbl = barrels

1. Large spill occurrence rates for Alaska North Slope, OCS and TAPS Pipeline are discussed in this Appendix.
2. The first number is the assumed pipeline size and the second number is the assumed facility size. The highest pipeline or facility spill size in the Alaska North Slope spill record is used for the NPR-A assumed large spill size. All other assumed large spill sizes are median spill sizes.
3. For purposes of analysis BLM uses Alternative D for the summation of the total estimated production.

a. The reserves, resources and large spill numbers in section 4.7.4 in Volume 3 assume an oil price of $160.00/barrel. In this table the reserves, resources and large spill numbers reflect a range of $60.00 to $160.00/barrel.

b. The assumed number of large spills is from USDOI Bureau of Ocean Energy Management (2012). It is estimated using the 1996-2010 spill rates in USDOI, Bureau of Ocean Energy Management (2012). For the Arctic Outer Continental Shelf, the 1996-2010 spill rates were compared to fault-tree rates in Bercha Group Inc. (2008 a, b, 2006). The greater number of estimated spills is represented in Table 4.6.1-4 of USDOI Bureau of Ocean Energy Management (2012). The USDOI Bureau of Ocean Energy Management (2012) large Outer Continental Shelf spill rate is about twice the spill rate as Bercha Group Inc (2008 a, b, 2006).

c. The values provided for the Arctic Outer Continental Shelf are the combined totals for the Beaufort and Chukchi Seas. For purposes of analysis half (1-3) of the estimated Outer Continental Shelf large pipeline spills (1-6) are assumed to occur onshore. Of those, 1-2 spills could occur from a large diameter common carrier pipeline across the NPR-A/Alaska North Slope and up to 1 onshore spill between the Colville and Canning Rivers from Outer Continental Shelf production in the Beaufort Sea.

d. The estimated large Trans-Alaska Pipeline System pipeline spills include the pipeline, pump stations, and associated tank farms and could occur along the entire length. Of those, 1-2 could occur on the North Slope and 2-4 along the rest of the pipeline length.

Appendix H:

Air Quality Related Values and Dispersion Modeling Results

Appendix H: Air Quality Related Values and Dispersion Modeling Results

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H.1 Introduction

The Bureau of Land Management (BLM) is undertaking the National Petroleum Reserve-Alaska (NPR-A) Integrated Activity Plan/Environmental Impact Statement (IAP/EIS) to determine the appropriate management of all BLM-managed lands in the NPR-A in light of new information about surface and subsurface resources and in a manner consistent with existing statutory direction.

The planning area includes all lands and only such lands as are managed by the BLM within the NPR-A. BLM-managed lands total approximately 22.5 million acres of surface and subsurface estate, approximately 429,000 of which are in bays, inlets, and lagoons. Nearly 250,000 additional acres of BLM-managed subsurface estate are under the Alaska Native Claims Settlement Act village corporation surface estate. (See Table 1-1 in Volume 1 and Map 1-1 in Volume 7; for a more detailed description of land status, see section 3.4.1. in Volume 1).

Modeling for the NPR-A project was originally conceived as a near-field/AERMOD effort only due to budget constraints (one-time end of year [FY'11] funds), lack of any Federal Class I areas in the vicinity of the project, and the large distance to any "sensitive" Class II areas (over 100 miles, which is well beyond the limitations of AERMOD).

The analysis protocol for the AERMOD modeling was under development when BLM was contacted by the U.S. Fish and Wildlife Service (FWS) to discuss possible long range transport modeling for potential impacts at the Arctic National Wildlife Refuge, managed by the FWS. After discussions with FWS, BLM agreed to perform this modeling for air quality related values (AQRV [visibility and atmospheric deposition]) impacts.

The AQRV modeling was done in collaboration with not only the FWS, but also with the National Parks Service (NPS), the USDA Forest Service (FS), and the Environmental Protection Agency (EPA) Region 10. Each agency contributed to the collaborative AQRV modeling effort as follows:

- BLM – Lead Agency – Project oversight and review, final CalPuff model runs, distribution of results and report preparation
- FWS – Preparation of AERMOD emissions for use in CalPuff, preparation of meteorological files, model code changes to allow use of polar stereographic coordinates and initial CalPuff runs
- EPA Regional 10 – Weather Research and Forecast (WRF) model output for use in CalPuff
- FS – Quality assurance (QA) of model code changes and model input files

The EPA-recommended CalPuff long-range transport model was used to estimate potential future AQRV impacts at the nearest "sensitive" Class II areas:

- Arctic National Wildlife Refuge (ANWR)
- Gates of the Arctic National Park and Preserve (Gates)

Highlights of the modeling methodologies are presented below, followed by the results of the AERMOD and CalPuff modeling.

H.2 Part I – AERMOD (Near-field)/NAAQS Results

The AERMOD modeling was performed by Golder Associates, Inc., under contract to the BLM Alaska State Office. The following information was extracted from their draft report to BLM, "Dispersion Modeling Assessment of Potential Future Development in the NPR-A - Air Quality Impact Assessments in Support of the Bureau of Land Management Integrated Activity Plan/Environmental Impact Statement Update."

Methodology

Assessment Areas

The two general assessment areas, chosen after discussion with the BLM, were:

- Near Nuiqsut, Alaska
- Near Atqasuk, Alaska

Nuiqsut was chosen because:

- It represents a relatively large village for the Alaskan arctic coastal plain;
- It is nearest to significant existing areas developed by the oil and gas industry (e.g., Alpine Development, Kuparuk River Unit, Prudhoe Bay Unit, and Duck Island Unit);
- It has a full complement of ambient monitoring data expected to capture impacts from both the village and the oil and gas developments, and,
- It is regionally representative of areas near the land/sea interface.

Atqasuk was chosen because it represents one of the few villages well inland within the NPR-A and is closer to some of the wilderness areas near the southern edge of the NPR-A such as the Noatak National Preserve, Kobuk Valley National Park, and Gates of the Arctic National Park and Preserve.

Emissions

Sources that were explicitly included in the AERMOD modeling are those sources associated with a hypothetical joint oil development complex for both the construction and operation phases. In particular, the following source category emissions were considered.

Exploration

- Ice road construction
- Ice pad construction
- On-road transport for personnel and supplies

Drill Rig Operation

- Construction (Central Processing Facility (CPF) and Satellites)
- Gravel borrow pit operations at CPF
- Gravel pad construction (CPF and satellites)
- Gravel road construction
- Pipeline construction
- Gravel airstrip construction (at the CPF)
- Air and ground transport for personnel and supplies

Operation (CPF and Satellite)

- Drill rig operation
- Support equipment operation (turbines/generators, heaters, incinerators, flares, etc.)
- Air and ground transport for personnel and supplies

Because the BLM has not received any actual development proposals to date, a hypothetical development scenario, based on actual existing development facilities was assumed. A number of historic EIS and permit applications were reviewed. In addition, staff members with the BLM Alaska State Office were consulted to refine these data and fill in data gaps.

Although there are likely to be some differences between the assumed emission sources considered in this assessment and the actual emissions that would occur in the future from such activities, it is believed that the source activity levels discussed in this section, and the associated estimated air pollutant emissions, will provide a conservative estimate of actual future emissions. One reason that these emission are likely to be conservative is that many of the projected activities will occur well in the future (in some cases ten or more years out), when regulatory requirements, new source performance standards, and new technologies are likely to lead to lower emissions than those based on current regulations and technologies as assumed in this assessment.

Meteorological Data

Available representative surface meteorological data from the National Climatic Data Center for Nuiqsut and Atqasuk were reviewed. Five years of data were obtained at each site spanning 2007 through 2011. After reviewing the data, some years of data were removed from further use due to inadequate data capture. The following years were used in the AERMOD analyses:

- Nuiqsut, Alaska – 2007, 2009-2011
- Atqasuk, Alaska – 2007, 2008, 2011

All surface meteorological data sets were processed with Barrow, Alaska upper air data to produce model-ready meteorological data.

Model Receptors

Outside of the 500 meter exclusion zone, an area around each development sites with signage and security to prevent the public from entering, model receptors were placed in a rectilinear grid as follows:

- At 100 meter spacing to a distance of 2,000 meters from the centroid of the emission sources.
- At 250 meter spacing to a distance of 4,000 meters from the centroid of the emission sources.
- At 1,000 meter spacing to a distance of 10,000 meters from the centroid of the emission sources.
- At 2,500 meter spacing to a distance of 50,000 meters from the centroid of the emission sources.

In addition, receptors were placed every 50 meters around the ambient air boundary surrounding each activity location (e.g. drilling pad, construction site, etc.). Flat terrain was assumed for all modeling.

The exception to this approach was along roadways, which due to limited control of the off-source areas and the relative consistency of their source-receptor geometry, have a smaller exclusion zone (100 meters) and no specific boundary line of receptors (e.g., impacts will be picked up within the regular grid of receptors). This was necessary to keep the total number of receptors in the modeling analysis to a reasonable value for computational purposes.

Background Air Quality Data

The Alaska Department of Environmental Conservation (ADEC) does not operate ambient air quality monitoring sites in the North Slope. The available ambient pollutant monitoring data have been collected by energy development companies and researchers. This data is shown in Table H-1 below along with the National Ambient Air Quality Standards (NAAQS).

Monitoring data for Hazardous Air Pollutants (HAPs) are not available in the study area. Background concentrations were added to modeled concentrations for comparison to the NAAQS.

Table H–1. Background concentrations and NAAQS

Pollutant	Averaging Time	Years Used	Calculated Background Conc. (µg/m^3)	NAAQS(µg/m^3)
NO_2	1-hr	2009-2011	39.5	188
	Annual	2009-2011	2.8	100
PM_{10}	24-hr	2009-2011	117	150
$PM_{2.5}$	24-hr	2009-2011	10	35
	Annual	2009-2011	1.13	15
CO	1-hr	2009-2011	1,947	40,000
	8-hr	2009-2011	1,231	10,000
SO_2	1-hr	2009-2011	44.5	196
	3-hr	2009-2011	19.8	1,300

µg/m^3 = micrograms per cubic meter (1 microgram equals 1x10-6 gram)

The AERMOD model has the ability to utilize measured hourly ambient ozone concentration data to estimate the conversion rate of nitrogen monoxide (NO) to nitrogen dioxide (NO_2) between the point of emission and the ambient receptor. Although there are several ways that this can be accomplished in AERMOD, the Ozone Limiting Method (OLM) was utilized for this study. The OLM method requires that in-stack $NO:NO_x$ ratios be provided for each source. This method also requires hourly background ozone data. An ambient equilibrium $NO_2 :NO_x$ ratio of 0.9 was also used. Hourly ozone data collected at the Nuiqsut monitoring site were paired with the hourly meteorological data used for the modeling for the same date and hour.

This Tier 3 analysis is consistent with the U.S. EPA guidance documents (USEPA 2010b, 2011a) on modeling analyses for the 1-hour NO_2 standard.

Air Modeling Results

Table H–2. AERMOD modeling results – Nuiqsut meteorological data; all scenarios

Pollutant	Averaging Time	Total Concentrations(µg/m^3)			
		Max – All Sources[a] with/without background	Max – Hypothetical Village[a] with/without background	NAAQS (µg/m^3)	PSD Class II Increment[b]
NO_2	1-hr	459/419	126.5/87.0	188	---
	Annual	10.89/8.07	3.79/0.97	100	25
PM_{10}	24-hr	221/103.7	128/11.4	150	30
$PM_{2.5}$	24-hr	20/10	11.0/1.03	35	---
	Annual	2.63/1.50	1.29/0.16	15	4
CO	1-hr	2,754/808	2,089/142	40,000	---
	8-hr	1,622/391	1,266/35.5	10,000	---
SO_2	1-hr	59.1/14.6	47.7/3.15	196	---
	3-hr	33.6/13.8	23.4/3.55	1,300	512

a. Includes background concentrations

b. Background concentrations not included when comparing to Prevention of Significant Deterioration (PSD) Increments

Table H–3. AERMOD modeling results – Atqasuk meteorological data; all scenarios

Pollutant	Averaging Time	Total Concentrations(µg/m^3)			
		Max – All Sources[a] with/without background	Max – Hypothetical Village[a] with/without background	NAAQS (µg/m^3)	PSD Class II Increment[b]
NO_2	1-hr	420/380	100/60.6	188	---
	Annual	11.2/8.35	3.80/0.98	100	25
PM_{10}	24-hr	307/190	134/17.1	150	30
$PM_{2.5}$	24-hr	20.2/10.2	11.1/1.10	35	---
	Annual	2.40/1.27	1.24/0.11	15	4
CO	1-hr	2,744/797.9	2,071/124	40,000	---
	8-hr	1,746/514.9	1,273/42.7	10,000	---
SO_2	1-hr	57.0/12.5	47.5/2.95/	196	---
	3-hr	34.7/14.9	23.8/4.02	1,300	512

a. Includes background concentrations

b. Background concentrations not included when comparing to Prevention of Significant Deterioration (PSD) Increments

Numerous HAPs were also included in the modeling for the three scenarios for three averaging times depending on the pathway for health effects. The thresholds for each averaging period are:

Non-cancer Health Effects

- 1-hour average (acute) – Acute Exposure Guideline Levels (AEGL; acute exposure levels for 1-hour mild effects [AEGL-1])
- 24-hour (sub-chronic) – (Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Level (MRL; for no adverse effects for 1 – 14 day exposures
- Annual (chronic) – Prioritized chronic dose-response values for screening risk assessments

Incremental Cancer Risk

Prioritized chronic dose-response values for screening risk assessments; a unit risk is an upper-bound excess lifetime cancer risk estimated to result from continuous exposure for a lifetime to an agent at a concentration of 1 $\mu g/m^3$ in air.

The modeling results show that non-cancer health effects thresholds were not exceeded for either the maximum overall impact or village impacts. None of the village impacts exceeded the cancer effects threshold.

The screening thresholds for Arsenic (Atqasuk) and Arsenic and Cadmium (Nuiqsut) for cancer effects were slightly exceeded and only at locations where members of the public would not be present for extended periods of time.

For the cumulative assessment, the ADEC identified 38 major stationary sources in the North Slope and 37 minor stationary sources requiring air quality permits. Major sources accounted for 96 percent of the total potential emissions from these sources. By far the majority of the permitted stationary emission sources on the North Slope are associated with the oil and gas industry, followed by electric power generation.

The cumulative model results showed no exceedance of any NAAQS.

H.3 Part II – CalPuff/AQRV Results

As mentioned in the introduction, CalPuff long range transport modeling was included after project initiation in response to a request from FWS and the National Park Service (NPS). The FWS suggested that modeling for AQRVs (visibility impairment and atmospheric deposition) be conducted to estimate potential future impacts at the Arctic National Wildlife Refuge (ANWR). The NPS park (Gates of the Arctic) was also added due to its proximity to the NPR-A.

The EPA-recommended long range transport model CalPuff was used for this assessment. A few highlights of the modeling methodology are presented below.

Methodology

The types and number of sources used in the CalPuff analysis are essentially the same as those from the AERMOD modeling. Minor changes were needed to translate the emissions into a CalPuff-ready format. Locations of the sources were also different given the different models' configuration and operation as well as the type of results required. The HAPs and other emissions that do not contribute to atmospheric deposition and visibility impacts were not included.

Because of the high arctic location of this analysis, it was necessary to use a polar stereographic map projection rather than the typical Lambert Conformal projection. The CalPuff model code had to be changed (added to) to accommodate the polar coordinate system. The code changes were written by the FWS and reviewed by the FS, along with graphics and animations of the model behavior. All indications were that the model was functioning appropriately.

The meteorological data for this analysis was provided by EPA Region 10. Weather Research and Forecast (WRF) model output was provided for the years 2007 – 2009 to BLM and the FWS. When FWS began reviewing the data, it was discovered that, for each year of data, only approximately 5.5 months (mid-June to end of November) of data for each year were present. This data was originally produced for modeling emissions for drilling platforms in the Beaufort and Chukchi seas, and reflects the period of operation of those sources.

Model receptors for the ANWR and Gates Class II areas were developed by the FWS and NPS, in concert with their respective Geographic Information Systems (GIS) staffs. Receptors were placed along the border of the park closest to the NPR-A and then spaced approximately 5 kilometers (km) in for a total of 4 rows of receptors covering about 20 km from the leading edge of the park.

Background AQRV data were not available for either of the Class II areas included in the analysis. Therefore, background data was taken from the nearest Class I area, Denali National Park (located about 325 km from the closest boundary of the NPR-A).

When the modeling utilizing the 2007-2009 meteorological data was nearly complete, one full year of WRF meteorological data was made available by the Bureau of Ocean Energy Management (BOEM) through their contract with the University of Alaska – Fairbanks for 2009. Although the partial-year 2009 data was already in use, a separate modeling run was performed with the BOEM data. This full year of WRF model data was processed differently (model options, switches, etc.) and on a different grid resolution (10 km for the BOEM data vs. 12 km for the partial year data). Because of these differences, it was decided that a separate model run was warranted.

The modeling domain was approximately 912 km by 660 km covering the project and receptor areas and beyond to allow proper model operation.

Results

The results of the CalPuff AQRV modeling are presented below. All results are for hypothetical project sources only.

Table H–4. Final visibility results for 3 years of partial meteorological data

Year	Max delta DV anywhere in domain	Number of Days >0.5 delta DV	Number of Days >1.0 delta DV
Alaska National Wildlife Refuge (ANWR)			
2007	0.51	1	0
2008	2.16	8	5
2009	2.85	24	13
Gates of the Arctic National Park and Preserve			
2007	1.71	4	2
2008	1.5	5	2
2009	5.53	41	20

DV = Deciview (the DV scale is linear to humanly-perceived changes in visual air quality and is analogous to the Decibel scale). Delta = Change

Table H–5. Final visibility results for 1 full year of meteorological data

Year	Max delta DV anywhere in domain	Number of Days >0.5 delta DV	Number of Days >1.0 delta DV
Alaska National Wildlife Refuge (ANWR)			
2009	2.18	33	8
Gates of the Arctic National Park and Preserve			
2009	2.65	51	19

DV = Deciview (the DV scale is linear to humanly-perceived changes in visual air quality and is analogous to the Decibel scale). Delta = Change

Table H–6. Final deposition* results for 3 years of partial meteorological data

Year	Total Nitrogen Deposition (kg/ha/yr)	Total Sulfur Deposition (kg/ha/yr)	Deposition Analysis Thresholds (kg/ha/yr)
Alaska National Wildlife Refuge			
2007	0.001	0.0002	0.005
2008	0.0084	0.0007	0.005
2009	0.002	0.0003	0.005
Gates of the Arctic National Park and Reserve			
2007	0.0071	0.001	0.005
2008	0.0095	0.0008	0.005
2009	0.0052	0.0006	0.005

* Deposition modeling was not done for full year of 2009 meteorological data

kg/ha/yr = kilograms per hectare per year (a hectare is a metric unit equal to 2.47 acres)

Glossary

Glossary

A

Acidophilus: Acid-loving (as in bacteria or plants); growing well in an acid medium.

Active floodplain: The flat area along a waterbody where sediments are deposited by seasonal or annual flooding; generally demarcated by a visible high water mark.

Aerial: Consisting of, moving through, found in, or suspended in the air.

Alluvial: Sedimentary material consisting mainly of coarse sand and gravel.

Alternatives: The different means by which objectives or goals can be attained. One of several policies, plans, or projects proposed for decision making.

Ambient: A term used to describe the environment as it exists at the point of measurement and against which changes (impacts) are measured.

Ambient air quality standard: Air pollutant concentrations of the surrounding outside environment that cannot legally be exceeded during fixed time intervals within a specific geographic area.

Amphidromous: A term used to describe fish that spawn and overwinter in rivers and streams, but migrate during the ice-free summer from these freshwater environments into coastal waters for months to feed.

Anadromous: A term used to describe fish that mature in the sea and swim up freshwater rivers and streams to spawn. Salmon, steelhead, and sea-run cutthroat trout are examples.

Anticline: An inverted bowl-shaped structure formed when sedimentary rock layers are folded to produce an arch or elongated dome.

Anoxic: The condition of an environment in which free oxygen is lacking or absent.

Anthropogenic: Of, relating to, or resulting from the influence of human beings on nature.

Aquatic: Growing, living in, frequenting, or taking place in water; in this IAP/EIS, used to indicate habitat, vegetation, and wildlife in freshwater.

Aromatic hydrocarbon: A hydrocarbon with a molecular structure involving one or more benzene unsaturated resonant rings of six carbon atoms, and having properties similar to benzene, which is the simplest of the aromatic hydrocarbons.

Archaeological resource: Place(s) where the remnants (e.g., artifacts) of a past culture survive in a physical context that allows for the interpretation of these remains. Archaeological resources can be districts, sites, buildings, structures, or objects and can be prehistoric or historic in nature.

Aufeis: Thick ice that builds up as a result of repeated overflow.

Authorized Officer (AO): Designated agency personnel responsible for a certain area of a project; for the National Petroleum Reserve-Alaska, generally the BLM State Director.

Available: When referring to oil and gas leasing, available lands could be offered for oil and gas leasing. Lands that are already leased could be offered for leasing if the existing lease ceases to exist.

B

Barrel: Unit of measurement consisting of 42 gallons of oil or other fluid.

Baseline data: Data gathered prior to the proposed action to characterize pre-development site conditions.

Biodegradable: Capable of being broken down by the action of living organisms such as microorganisms.

Biological Assessment (BA): A document prepared by or under the direction of a federal agency; addresses listed and proposed species and designated and proposed critical habitat that may be present in the action area, and evaluates the potential effects of the action on such species and habitat.

Black water: Discharge that includes wastewater from any or all of the following: toilets, urinals, sewage treatment systems.

Bonding capacity: An amount, determined by market analysts, based on a government entity's prior bonding experience, actual repayment performance, and its ability to service future, periodic debt. It affects the ability of municipalities to issue and sell bonds to generate funds for capital improvements.

Bore-hole: The opening in the ground that is created when drilling a well; may refer to the inside diameter of the bore-hole wall, the rock face that bounds the drilled hole.

Bottomfast ice: Ice that is firmly attached or grounded to the bottom of a waterbody, which is often frozen from top to bottom.

Brackish: Water that is intermediate between salt and fresh water; often occurs at the mouths of rivers, where fresh water mixes with salt water.

Brine: General description of water that is produced with oil. The water is associated with the oil-producing formation and can have varying amounts of dissolved salts.

Brood: A group of young birds being cared for by an adult bird; generally the surviving hatchlings from one or more clutches of eggs.

Bureau of Land Management (BLM): An agency of the United States government, under the U.S. Department of the Interior, responsible for administering certain public lands of the United States.

Burin: A tool flaked into a chisel point for inscribing or grooving bone, wood, leather, stone, or antler.

C

Calving area: A large area where large mammals, particularly ungulates such as caribou, congregate to give birth to their young.

Capital expenses: The money spent to purchase or upgrade physical assets, such as buildings or machinery.

Carrion: Dead or dying flesh of animals.

Class I air quality area: One of 156 protected areas such as national parks (over 6,000 acres), wilderness areas (over 5,000 acres), national memorial parks (over 5,000 acres), and international parks that were in existence as of August 1977, where air quality should be given special protection. Federal Class I areas are subject to maximum limits on air quality degradation called air quality increments (often referred to as Prevention of Significant Deterioration [PSD] increments). All areas of the United States not designated as Class I are **Class II** areas. The air quality standards in Class I areas are more stringent than national ambient air quality standards.

Council on Environmental Quality (CEQ): An advisory council to the President of the United States; established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA): An act that provided the authority for money administered by the Environmental Protection Agency to identify and clean up hazardous waste sites; also known as Superfund.

Code of Federal Regulations (CFR): A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government.

cfs: Cubic feet per second; 1 cfs equals 448.33 gallons per minute.

Commercial field: Oil or natural gas fields that can be produced such that they provide a suitable return on investment.

Commercial oil (or natural gas) reserves: Oil or natural gas reserves that can be produced such that they provide a suitable return on investment.

Commercially recoverable: See commercial oil (or natural gas) reserves.

Concern: A point, matter, or question raised by management or the public that must be addressed in the planning process.

Conglomerate: Sedimentary rock consisting of gravel and small boulders.

Consistency determination: A finding by a state or federal agency that a project or agency action is consistent with a required agency program, guideline, or regulation, such as the Alaska Coastal Zone Management Program.

Consultation: Exchange of information and interactive discussion; when the "C" in consultation is capitalized it refers to consultation mandated by statute or regulation that has prescribed parties, procedures, and timelines (e.g., Consultation under NEPA or section 7 of the Endangered Species Act).

Criteria: Data and information that are used to examine or establish the relative degrees of desirability of alternatives or the degree to which a course of action meets an intended objective.

Criteria air pollutants: The six most common air pollutants in the U.S.: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (both PM_{10} and $PM_{2.5}$ – inhalable and respirable particulates), and sulfur dioxide (SO_2). Congress has focused regulatory attention on these six pollutants because they endanger public health and the environment, are widespread throughout the U.S., and come from a variety of sources. Criteria air pollutants are typically emitted from many sources in industry, mining, transportation, electricity generation, energy production and agriculture.

Cultural resources: The remains of sites, structures, or objects used by humans in the past, historic or prehistoric. More recently referred to as heritage resources.

Cumulative effects or impacts: The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant actions, taken place over a period of time.

D

Deferred: When referring to oil and gas leasing, deferred indicates that lands would not be offered for lease until a specified period has expired. For example, a ten-year deferral would mean that the deferred lands would not be offered for leasing until the expiration of ten years from the Record of Decision establishing the ten-year deferral.

Demersal: Living near, deposited on, or sinking to the seabed.

Density: The number of individuals per a given unit area.

Deposit: A natural accumulation, as of precious metals, minerals, coal, gas, and oil that may be pursued for its intrinsic value; gold deposit.

Development: The phase of petroleum operations that occurs after exploration has proven successful, and before full-scale production. The newly discovered oil or gas field is assessed during an appraisal phase, a plan to fully and efficiently exploit it is created, and additional wells are usually drilled.

DEW-Line: Distant Early Warning-Line. A site designed and built during the Cold War as the primary line of air defense warning of "Over the Pole" invasion of the North American Continent.

Dilution: The act of mixing or thinning, and therefore, decreasing a certain strength or concentration.

Dispersion: The act of distributing or separating into lower concentrations or less dense units.

Dissociable: Able to break up into simpler chemical constituents.

Diversity: An expression of community structure; high if there are many equally abundant species; low if there are only a few equally abundant species. The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

Draft Environmental Impact Statement (DEIS): The draft statement of the environmental effects of a major federal action, which is required under section 102 of the National Environmental Policy Act, and released to the public and other agencies for comment and review.

Drilling fluid (mud): A preparation of water, clay, and chemicals circulated in a well during drilling to lubricate and cool the drill bit, flush rock cuttings to the surface, prevent sloughing of the sides of the hole, and prevent the flow of formation fluids into the bore-hole or to the surface.

Drilling pad: A temporary drilling site, usually constructed of local materials such as gravel.

Duck pond: A small, flat-bottomed plastic receptacle placed under a vehicle to catch and contain any contaminated fluids that may melt or drip from the underside of the vehicle.

E

Economically recoverable: See commercially recoverable.

Effect: Environmental change resulting from a proposed action. Direct effects are caused by the action and occur at the same time and place, while indirect effects are caused by the action, but are later in time or further removed in distance, although still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effect and impact are synonymous as used in this document.

Employment: Labor input into a production process, measured in the number of person-years or jobs; the number of jobs required to produce the output of each sector. A person-year is approximately 2,000 working hours by one person working the whole year or by several persons working seasonally. A job may be 1 week, 1 month, or 1 year.

Endangered species: Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range; plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

Energy budget: The flow of energy through an organism or ecosystem. For an organism, it is the amount of energy being absorbed (e.g., food) in relation to the amount of energy expended and lost as heat.

Environment: The physical conditions that exist within an area (e.g., the area that will be affected by a proposed project), including land, air, water, minerals, flora, fauna, ambient noise, and objects of historical or aesthetic significance. The sum of all external conditions that affect an organism or community to influence its development or existence.

Environmental Assessment (EA): A concise public document, for which a federal agency is responsible, that serves to: (1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; (2) aid an agency's compliance with the National Environmental Policy Act when no environmental impact statement is necessary; and, (3) facilitate preparation of an environmental impact statement when one is necessary.

Environmental Justice: The fair treatment and meaningful involvement of all people, regardless of natural origin or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socio-economic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. Executive Order 12898 directs federal agencies to achieve environmental justice as part of their missions by identifying and addressing disproportionately high adverse effects of agency programs, policies, and activities, on minority and low-income populations.

Environmental Impact Statement (EIS): An analytical document prepared under the National Environmental Policy Act (NEPA) that portrays the potential impacts to the environment of a Preferred Action and its possible alternatives. An ElS is developed for use by decision-makers to weigh the environmental consequences of a potential decision.

Erosion: The wearing away of the land surface by running water, wind, ice, or other geologic agents, including gravitation creep.

Eskimo: An ethnonym (name given to a group by another group) referring to speakers of the Inuit language family who live in the Arctic and Subarctic regions of North America (e.g., Canada, Greenland, and Alaska) and eastern Siberia.

Essential Fish Habitat (EFH): As defined by Congress in the interim final rule (62 FR 66551): "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." For the purpose of interpreting the definition of EFH habitat, "waters" include aquatic areas and their associated physical, chemical, and biological properties; "substrate" includes sediment underlying the waters; "necessary" refers to the habitat required to support a sustainable fishery and the managed species contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers all habitat types utilized by a species throughout its life cycle.

Estuary: An estuary is a partially enclosed body of water formed where freshwater from rivers and streams flows into the ocean, mixing with the salty seawater. Estuaries and the lands surrounding them are places of transition from land to sea, and from fresh to salt water.

Ethnographic: Of or pertaining to the descriptive and analytical study of the culture of particular self-defined groups or communities.

Exploration: The search for economic deposits of minerals, gas, oil or coal through the practices of geology, geochemistry, geophysics, drilling, shaft sinking, and/or mapping.

Exploratory unit: Exploratory units normally embrace a prospective area delineated on the basis of geological and/or geophysical inference and permit the most efficient and cost-effective means of developing underlying oil and gas resources.

F

°F: Degrees Fahrenheit.

Fast-ice zone: Area along the coast covered by sea ice that is continuous with and attached to the shoreline.

Feasible: Capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.

Final Environmental Impact Statement (Final EIS): A revision of the Draft Environmental Impact Statement that includes public and agency comments on the draft.

Fisheries habitat: Streams, lakes, and reservoirs that support fish populations.

Fishery: The act, process, occupation, or season of taking an aquatic species.

Floodplain: The lowland and relatively flat area adjoining inland waters, including, at a minimum, that area subject to a 1 percent or greater chance of flooding in any given year.

Fluvial: Of or relating to a stream or river.

Fossil: Evidence or remnant of a plant or animal preserved in the earth's crust (e.g., skeleton, footprint, or leaf print).

Fossil fuel: Petroleum, natural gas, and coal; fuel derived from biologic material that was deposited into sedimentary rocks.

Frequency: The number of samples in which a plant or animal species occurs divided by the total number of samples.

Fugitive dust: Dust particles suspended randomly in the air, usually from road travel, excavation, and/or rock loading operations.

G

Game Management Unit (GMU): A geographic division made by the Alaska Department of Fish and Game for the management of fish and wildlife in the State. Different GMUs have different hunting and fishing seasons, bag limits, and other harvest rules.

Geology: The scientific study of the origin, history, and structure of the earth; the structure of a specific region of the earth's surface.

Geomorphic: Pertaining to the structure, origin, and development of the topographical features of the earth's crust.

Gill net: Nets made of one or more layers of mesh, used to catch fish by entanglement as they attempt to swim through the net.

Glacial drift: Unsorted sediments deposited by glaciers and not subsequently reworked by water; coarse-grained materials (e.g., rock and sand) suspended in a fine-grained (e.g., silt) matrix. The term applies to all mineral material transported by a glacier and deposited directly by or from the ice, or by running water emanating from a glacier.

Global warming: An increase over time of the average temperature of the earth's atmosphere and oceans. It is generally used to describe the temperature rise over the past century or so, and the effects of humans on the temperature.

Gray water: Discharge that includes wastewater from any or all of the following: kitchen sink, shower, drinking water, and laundry.

Greenhouse effect: A process by which thermal radiation from a planetary surface is absorbed by atmospheric greenhouse gases and is reradiated in all directions. Since part of this reradiation is back toward the earth's surface and the lower atmosphere, it results in an elevation of the average surface temperature above what it would be in the absence of the gases.

Greenhouse gas (GHG): A gas that absorbs and emits thermal radiation within the lowest layers of the atmosphere. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases that are considered air pollutants are carbon dioxide, (CO_2), methane (CH_4), nitrous oxide (N_2O), and chlorofluorocarbons (CFCs).

Groundwater: Water found beneath the land surface in the zone of saturation below the water table.

H

Habitat: The natural environment of a plant or animal, including all biotic, climatic, and soil conditions, or other environmental influences affecting living conditions. The place where an organism lives.

Hazardous air pollutants (HAPs): (also known as toxic air pollutants) Those pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects. The

Environmental Protection Agency (EPA) is required to control 187 hazardous air pollutants. Examples of HAPs include benzene (found in gasoline), perchlorethlyene (emitted from dry cleaning facilities), and methylene chloride (used as a solvent).

Hazardous waste: As defined by the Environmental Protection Agency, a waste that exhibits one or more of the following characteristics: ignitability, corrosivity, reactivity, and/or toxicity. Hazardous wastes are listed in 40 CFR § 261.3 and 40 CFR § 171.8.

Headwaters: The upper reaches of a stream where the stream forms.

Hydrocarbon: A naturally occurring organic compound comprised of hydrogen and carbon. Hydrocarbons can occur in molecules as simple as methane (one carbon atom with four hydrogen atoms), but also as highly complex molecules, and can occur as gases, liquids, or solids. The molecules can have the shape of chains, branching chains, rings, or other structures. Petroleum is a complex mixture of hydrocarbons. The most common hydrocarbons are natural gas, oil, and coal.

Hydrologic system: The combination of all physical factors, such as precipitation, stream flow, snowmelt, and groundwater that affect the hydrology of a specific area.

I

Impermeable: Not permitting passage of fluids through its mass.

Impoundment: The collection and confinement, usually of water (in the case of mining, tailings materials), in a reservoir or other storage area.

Increment: An amount of change from an existing concentration or amount, such as air pollutant concentrations.

Indigenous: Having originated in and being produced, growing, living, or occurring naturally in a particular region or environment.

Indirect impacts: Impacts that are caused by an action, but are later in time or farther removed in distance, although still reasonably foreseeable.

Infrastructure: The underlying foundation or basic framework; substructure of a community (i.e., schools, police, fire services, hospitals, water, and sewer systems).

Insect-relief area: An area of the North Slope with relatively low numbers of insects that is used by caribou for relief from insects.

Interstitial ice: Ice found in cavities or lodged between soil grains or rock crevices.

Irretrievable: A term that applies to losses of production, harvest, or commitment of renewable natural resources. For example, some or all of the wildlife forage production from an area is irretrievably lost during the time an area is used as an oil or gas development site. If the use changes, forage production can be resumed. The production lost is irretrievable, but the act is not irreversible.

Irreversible: A term that applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

Isobath: Depth interval contour, as commonly mapped for lake or ocean bottoms.

J

Jurisdictional wetland: A wetland area delineated and identified by specific technical criteria, field indicators, and other information, for the purposes of public agency jurisdiction. The U.S. Army Corps of Engineers regulates "dredging and filling" activities associated with jurisdictional wetlands. Other federal agencies that can become involved with matters that concern jurisdictional wetlands include the U.S. Department of Interior's Fish and Wildlife Service, the Environmental Protection Agency, and the Natural Resource Conservation Service.

L

Landfast ice: Stationary ice that is continuous with, and attached to, the shoreline and extends out into the waterbody.

Landform: Any physical, recognizable form or feature on the earth's surface having a characteristic shape, which is produced by natural causes. Landforms provide an empirical description of similar portions of the earth's surface.

Land management: The intentional process of planning, organizing, programming, coordinating, directing, and controlling land use actions.

Landscape: The sum total of the characteristics that distinguish a certain area on the earth's surface from other areas; these characteristics are a result not only of natural forces, but also of human occupancy and use of the land. An area composed of interacting and interconnected patterns of habitats (ecosystems), which are repeated because of geology, landforms, soils, climate, biota, and human influences throughout the area.

Land status: The ownership status of lands.

Land use allocation: The assignment of a management emphasis to particular land areas with the purpose of achieving the goals and objectives of some specified use(s) (e.g., campgrounds, wilderness, logging, and mining).

Laterally discontinuous: Not continuous in the horizontal plane. For example, in an area with laterally discontinuous permafrost, the permafrost is not uniformly found across the entire area without interruption.

Lead: Long cracks in the ice, used by both whales and boats to travel through the water.

Liquid natural gas: Natural gas which has been liquefied by reducing its temperature to -260 °F at atmospheric pressure. It will remain as a liquid at -116 °F and 673 pounds per square inch above atmospheric pressure.

Listed species: Species that are listed as threatened or endangered under the Endangered Species Act of 1973 (as amended).

Long-term impacts: Impacts that normally result in permanent changes to the environment. An example is the loss of habitat due to development of a gravel pit. For each resource, the definition of long-term may vary.

M

Maktak: Eskimo delicacy consisting of the skin and the thin layer of subcutaneous fat of whales.

Management activity: A human activity imposed on a landscape for the purpose of harvesting, traversing, transporting, or replenishing natural resources.

Management area: An area delineated on the basis of management objective prescriptions.

Management concern: An issue, problem, or condition that influences the range of management practices identified in a planning process.

Management direction: A statement of multiple use and other goals and objectives, and the associated management prescriptions, standards, and guidelines for attaining them (36 CFR § 219.3).

Masu: A starchy tuber found in arctic and subarctic regions (vernacular is "Eskimo potato").

Mean: A statistical value calculated by dividing the sum of a set of sample values by the number of samples. Also referred to as the arithmetic mean or average.

Migratory: Moving from place to place, daily or seasonally.

Mitigation: Steps taken to: (1) avoid an impact altogether by not taking a certain action or parts of an action; (2) minimize an impact by limiting the degree or magnitude of the action and its implementation; (3) rectify an impact by repairing, rehabilitating, or restoring the affected environment; (4) reduce or eliminate an impact over time by preserving and maintaining operations during the life of the action; and, (5) compensate for an impact by replacing or providing substitute resources or environments (40 CFR Part 1508.20).

Memorandum of Understanding (MOU): Usually documents an agreement reached among federal agencies.

N

National Environmental Policy Act (NEPA): An act declaring a national policy to encourage productive and enjoyable harmony between humankind and the environment; promote efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity; enrich the understanding of the ecological systems and natural resources important to the nation; and establish a Council on Environmental Quality.

Net present value (NPV): The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area.

National Pollutant Discharge Elimination System (NPDES): A program authorized by sections 318, 402, and 405 of the Clean Water Act, and implemented by regulations 40 CFR § 122. The NPDES program requires permits for the discharge of pollutants from any point source into waters of the United States.

No-Surface-Occupancy: An area that is open for mineral leasing but analysis has found that in order to protect other resource values, no surface occupancy is permitted for oil and gas facilities or infrastructure.

Non-Associated Gas: Gas in a reservoir having little or no crude oil.

NO_x: Mono-nitrogen oxides, including nitric oxide (NO) and nitrogen dioxide (NO_2). It is formed when naturally occurring atmospheric nitrogen and oxygen are combusted with fuels in automobiles, power plants, industrial processes, and home and office heating units.

O

Objective: A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used to achieve identified goals.

Oiled: Having oil on skin, fur, or feathers after coming into contact with an oil spill.

Ozone: Form of oxygen found largely in the stratosphere; a product of the reaction between ultraviolet light and oxygen.

P

Particulates: Small particles suspended in the air, generally considered pollutants.

Pelagic: Pertaining to the ocean and especially to animals (typically marine mammals, birds, or fish) that live at the surface of the ocean away from the coast.

Per capita income: Total income divided by the total population.

Performance-based stipulation: A stipulation applied to a lease that provides a stated objective that must be met, along with requirements and guidelines, but provides some leeway as to how that objective can be met and maintained by the lessee; compare to prescriptive-based stipulation.

Permafrost: Permanently frozen ground.

Permanent oil and gas facilities: Production facilities, pipelines, roads, airstrips, production pads, docks, seawater treatment plants, and other structures associated with oil and gas production that occupy land for more than one winter season. Material sites and seasonal facilities, such as ice roads, are excluded, even when the pads are designed for use in successive winters.

Permeability: The property or capacity of a porous rock, sediment, or soil for transmitting a fluid; a measure of the relative ease of fluid flow under unequal pressure.

Photoperiod: In reference to cycles of light and darkness, the length of time that uninterrupted light is present, generally the length of daylight in a given 24-hour period.

Physiographic province: A region having a particular pattern of relief features or land forms that differs significantly from that of adjacent regions (e.g., Arctic Coastal Plain).

Pingo: A low conical hill or mound forced up by hydrostatic pressure in an area underlain by permafrost and consisting of an outer layer of soil covering a core of solid ice. Pingos range from 6 to 160 meters in height.

Planning area: An administrative unit determined by the Bureau of Land Management based on resources and management issues.

Plant community: A vegetation complex, unique in its combination of plants, which occurs in particular locations under particular influences. A plant community is a reflection of integrated environmental influences on the site, such as soils, temperature, elevation, solar radiation, slope aspect, and precipitation.

Pollution: Human-caused or natural alteration of the physical, biological, and radiological integrity of water, air, or other aspects of the environment that produce undesired effects.

Polygon: A surface landform resulting from repeated freeze-thaw cycles common in permafrost areas. Polygons are bounded by troughs of ice or water and generally occur in networks that form regular geometric designs with multiple square sides of nearly equal lengths.

Polynyas: Non-linear openings in the sea ice.

Porosity: The ratio of the volume of void space in a material (e.g., sedimentary rock or sediments) to the volume of its mass.

Potable: Suitable, safe, or prepared for drinking, as in potable water.

Pot hunting: The removal or theft of artifacts from cultural resource sites by untrained individuals for profit and recreation.

Prescriptive-based stipulation: A stipulation applied to leases with exacting requirements applying to lessee activities; compare to performance-based stipulation.

Prevention of significant deterioration (PSD): A special permit procedure established in the Clean Air Act, as amended, used to ensure that economic growth occurs in a manner consistent with the protection of public health and preservation of air quality related values in national special interest areas.

Pristine: Pure, original, and uncontaminated.

Prospect: An area of exploration in which hydrocarbons have been predicted to exist in commercially recoverable quantities.

Public scoping: A process whereby the public is given the opportunity to provide oral or written comments about the influence of a project on an individual, the community, and/or the environment.

Pulse: A group of whales; the term is applied to whales migrating across the Chukchi and Beaufort seas, when there are more individuals in each pod of whales and more pods than usual.

Pyrogenic: Producing or produced by heat.

R

Raptor: Bird of prey; includes eagles, hawks, falcons, and owls.

Recharge: Absorption and addition of water into the zone of saturation.

Record of Decision (ROD): A document separate from, but associated with, an Environmental Impact Statement, which states the decision, identifies alternatives (specifying which were environmentally preferable), and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and, if not, why not (40 CFR § 1505.2).

Recoverable reserves: Oil and gas reserves that may be recoverable by the application of technology, but not necessarily commercially recoverable.

Regulated air pollutants: Pollutants first set forth in the Clean Air Act (CAA) of 1970 and are the basis upon which the Federal government and state regulatory agencies have established emission thresholds and regulations. Regulated air pollutants include criteria air pollutants, hazardous air pollutants (HAPs), volatile organic compounds (VOCs), and greenhouse gases. The same pollutant may be regulated under more than one of the regulatory standards.

Reservoir (oil or gas): A subsurface body of rock having sufficient porosity and permeability to store and transmit fluids. Sedimentary rocks are the most common reservoir rocks because they have more porosity than most igneous and metamorphic rocks and form under temperature conditions at which hydrocarbons can be preserved. A reservoir is a critical component of a complete petroleum system.

Resident: A species that is found in a particular habitat for a particular time period (e.g., winter resident or summer resident) as opposed to a species found only when passing through during migration.

Resource Management Plan (RMP): Comprehensive land management planning document prepared by and for the Bureau of Land Management's administered properties under requirements of the Federal Land Policy and Management Act. Bureau of Land Management lands in Alaska were exempted from this requirement.

Rideup: A raised-relief ice formation that is formed when a moving ice sheet is forced up and over other structures such as land or ice.

Riffles: Stream segments where the water is relatively shallow, current velocity is relatively high, and sediments are coarse; riffles are located in between areas of deeper, slower water (pools).

Rift zone: Zone of faulting where rocks are pulled apart.

Riparian: Occurring adjacent to streams and rivers and directly influenced by water. A riparian community is characterized by certain types of vegetation, soils, hydrology, and fauna and requires free or unbound water or conditions more moist than that normally found in the area.

Risked mean: The arithmetic average of all possible resource outcomes weighted by their probabilities. Risked (unconditional) estimates of resources such as oil or natural gas consider the possibility that the area may be devoid of those resources. Statistically, the risked mean may be determined through multiplication of the mean of a conditional distribution by the related probability of occurrence.

Rolligon: A brand name or make of wheeled vehicle that exerts low pressure on the ground, and is designed to travel across sensitive areas such as tundra with minimal disturbance.

S

Satellite field: An oil reserve located near an existing oil development, allowing shared use of the infrastructure.

Scenic River: River designation, under the Federal Wild and Scenic Rivers Program, on the basis of undisturbed and scenic character. Scenic rivers are given special management criteria by federal agencies.

Scoping process: A part of the National Environmental Policy Act process; early and open activities used to determine the scope and significance of the issues, and the range of actions, alternatives, and impacts to be considered in an Environmental Impact Statement (40 CFR § 1501.7).

Sediments: Unweathered geologic materials generally laid down by or within waterbodies; the rocks, sand, mud, silt, and clay at the bottom and along the edge of lakes, streams, and oceans.

Sensitive species: Plant or animal species that are susceptible or vulnerable to activity impacts or habitat alterations. Species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species.

Short-term impacts: Impacts occurring during project construction and operation, and normally ceasing upon project closure and reclamation. For each resource, the definition of short-term may vary.

Sidetrack well: A secondary well-bore drilled away from an original well-bore. A sidetracking operation may be done intentionally or may occur accidentally.

Significant: The description of an impact that exceeds a certain threshold level. Requires consideration of both context and intensity. The significance of an action must be analyzed in several contexts, such as society as a whole, and the affected region, interests, and locality. Intensity refers to the severity of impacts, which should weighted along with the likelihood of its occurrence.

SO_x: Sulfur oxides, including sulfur dioxide (SO_2). A product of vehicle tailpipe emissions.

Sociocultural: Of, relating to, or involving a combination of social and cultural factors.

Socioeconomic: Pertaining to, or signifying the combination or interaction of social and economic factors.

Soil horizon: A layer of soil material approximately parallel to the land surface that differs from adjacent genetically related layers in physical, chemical, and biological properties.

Solid waste: Garbage, refuse, and/or sludge produced during oil and gas exploration and development activities.

Spawning: Production, deposition, and fertilization of eggs by fish.

Special use permit: A permit issued under established laws and regulations to an individual, organization, or company for occupancy or use of federal or state lands for some special purpose.

Spill Prevention Control and Countermeasure Plan (SPCC): A plan that the Environmental Protection Agency requires to be on file within six months of project inception. It is a contingency plan for avoidance of, containment of, and response to spills or leaks of hazardous materials.

Spine road: The existing all-season gravel road connecting the oil and gas facilities at Kuparuk (Kuparuk Base Camp) with those at Prudhoe Bay (Prudhoe Bay Operations Center).

Standard: A model, example, or goal established by authority, custom, or general consent as a rule for the measurement of quantity, weight, extent, value, or quality.

Stipulation: A requirement or condition placed by the Bureau of Land Management on the leaseholder for operations the leaseholder might carry out within that lease. The Bureau of Land Management develops stipulations that apply to all future leases within the National Petroleum Reserve-Alaska.

Stratigraphic trap: An oil or gas reservoir in which the hydrocarbons are trapped because of a lateral change in the physical characteristics of the reservoir or a change in the lateral continuity of the rocks.

Strike: The act of throwing a darting gun harpoon with a black powder or penthrite bomb into a whale. A strike may or may not result in a dead whale, which may or may not result in a landed whale. The International Whaling Commission considers and counts the number of strikes and landed whales in their quota allocation to the U.S. government (and hence to the Alaska Eskimos). Unused strikes can be transferred to other individuals or groups harvesting whales.

Subsistence: Harvesting of plants and wildlife for food, clothing, and shelter. The attainment of most of one's material needs (e.g., food and clothing materials) from wild animals and plants.

T

Talik: An unfrozen section of ground found above, below, or within a layer of discontinuous permafrost. These layers can also be found beneath waterbodies in a layer of continuous permafrost.

Tectonic plate: A large, thin, relatively rigid plate that moves relative to other plates on the outer surface of the earth.

Terrestrial: Of or relating to the earth, soil, or land; inhabiting the earth or land.

Thermokarst: Land-surface configuration that results from the melting of ground ice in a region underlain by permafrost. In areas that have appreciable amounts of ice, small pits, valleys, and hummocks form when the ice melts and the ground settles unevenly.

Threatened species: A plant or animal species likely to become an endangered species throughout all or a significant portion of its range within the foreseeable future.

Total petroleum system: The combination of geologic components and processes necessary to generate and store hydrocarbons, including a mature source rock, migration pathway, reservoir rock, trap, and seal. Includes all the petroleum generated by related source rocks and resides in a volume of mappable rocks. Geologic processes act upon the petroleum system and control the generation, expulsion, migration, entrapment, and preservation of petroleum.

Traditional knowledge: An intimate understanding by indigenous peoples of their environment, which is grounded in a long-term relationship with the surrounding land, ocean, rivers, ice, and resources. This understanding includes knowledge of the anatomy, biology, and distribution of resources; animal behavior; seasons, weather, and climate; hydrology, sea ice, and currents; how ecosystems function; and the relationship between the environment and the local culture.

Transfer payment: Money given by the government to citizens, such as Social Security, welfare, and unemployment compensation.

Trophic system: The process and organisms that move food energy through the ecosystem, often termed a food chain.

Tundra: Level or undulating treeless plain characteristic of northern Arctic regions, consisting of black mucky soil with permanently frozen subsoil and a dense growth of mosses, lichens, dwarf herbs, and shrubs.

Turbidity: A measure of the amount of suspended sediment in water.

U

Unavailable: When referring to oil and gas leasing, unavailable lands would not be offered for oil and gas leasing.

Unconventional oil and gas: Reservoir oil and gas that is more difficult or less economical to extract, usually because the technology to reach them has not been developed fully, or is too expensive.

V

Volatile Organic Compounds (VOCs): A group of chemicals that react in the atmosphere with nitrogen oxides in the presence of sunlight and heat to form ozone. VOCs contribute significantly to photochemical smog production and certain health problems. Examples of VOCs are gasoline fumes and oil-based paints.

W

Waterflooding: The injection of water into geological reservoirs to maintain or increase pressure in the reservoir and thereby assist in the extraction of oil.

Water quality: The interaction between various parameters that determines the usability or non-usability of water for on-site and downstream uses. Major parameters that affect water quality include: temperature, turbidity, suspended sediment, conductivity, dissolved oxygen, pH, specific ions, discharge, and fecal coliform.

Wetlands (biological wetlands): Those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstance do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include habitats such as swamps, marshes, and bogs (see jurisdictional wetlands).

Wildcat play: An unproven and prospective area of oil and gas potential that is outside of existing oil- and gas-producing areas or zones.

Wilderness: Land designated by Congress as a component of the National Wilderness Preservation System. For an area to be considered for Wilderness designation it must be roadless and possess the characteristics required by section 2(c) of the Wilderness Act of 1964. These characteristics are: (1) naturalness—lands that are natural and primarily affected by the forces of nature; (2) roadless and having at least 5,000 acres of contiguous public lands; and (3) outstanding opportunities for solitude or primitive and unconfined types of recreation. In addition, areas may contain “supplemental values,” consisting of ecological, geological, or other features of scientific, educational, scenic, or historical importance.

Bibliography

Bibliography

ABR, Inc. 2006. Environmental Research and Services, Fairbanks, AK, Fourth annual report for ConocoPhillips Alaska, Inc., and Anadarko Petroleum Corporation, Anchorage, by. 31 pp.

________. **2007.** Tundra recovery of former ice pad, Puviaq One exploratory well site, National Petroleum Reserve – Alaska (NPR-A): 2006 Progress Report. Unpubl. rept. for ConocoPhillips Alaska, Inc. Anchorage, AK. Alaska Clean Seas. 2010. Alaska Clean Seas Technical Manual, Volume 1 Tactics Description. Alaska Clean Seas, Prudhoe Bay, AK. http://alaskacleanseas.org/wp-content/uploads/2010/12/ACS_Tech_Manual_Rev9_Vol1-TACTICS.pdf

Adaptation Advisory Group (AAG). 2010. Alaska's Climate Change Strategy: Addressing Impacts in Alaska.

Adler, A., E.J. Boyko, C.D. Shraer, N.J. Murphy. 1994. Lower prevalence of impaired glucose tolerance and diabetes associated with daily seal oil or salmon consumption among Alaska Natives. Diabetes Care 17(12): 1498-1501.

________**, E.J. Boyko, C.D. Shraer, N.J. Murphy. 1996.** Negative Association between traditional physical activities and the prevalence of glucose intolerance in Alaska Natives. Journal of Diabetic Medicine 13(6): 555-60.

Advameg, Inc. 2009. All cities in Alaska: [http://www.city-data.com/city/Alaska.html]

Advisory Committee on Population Health (ACPH). 1999. Toward a Healthy Future: Second Report on the Health of Canadians: Ministry of Health, meeting of the Ministers of Health, Charlottetown, Canada.

Agler, B.A., S.J. Kendall, P.E. Seiser, D.B. Irons. 1995. Estimates of marine bird and sea otter abundance in lower Cook Inlet, Alaska during summer 1993 and winter 1994. Outer Continental Shelf Study MMS 94-0063. U.S. Fish and Wildlife Service, Anchorage, Alaska. 124 pp.

Ainley, D.G. and D.P. DeMaster. 1990. The upper trophic levels in polar marine ecosystems. *In*: Smith, W.O. Jr. (ed.). Polar oceanography. Part B: chemistry, biology, and geology. Academic Press, London, UK, pp. 599-630.

Ahmaogak Sr. G. 2004. Keynote address at the Alaska Forum on the Environment. Feb. 2004. Accessed online at: http://www.nativescience.org/assets/Documents/PDF%20Documents/MayorAFEspeech2004.pdf on 7/6/2006

Ahtuangaruak, R. 1997. Scoping Testimony. Transcript of Public Hearing, Draft Environmental Impact Statement for the Beaufort Sea Proposed Oil and Gas Lease Sale 170, Nuiqsut, Alaska.

________. **2001.** Scoping Testimony. Draft Environmental Impact Statement Hearing, Liberty Development and Production Plan. Nuiqsut, Alaska, March 19, 2001.

________. **2003.** Public Testimony at the Public Hearing on the Draft Integrated Activity Plan/Environmental Impact Statement for the Northwest National Petroleum Reserve- Alaska, 2003 March 13, Washington, D.C., U.S.

Alaska Biological Research, Inc. 2007. Variation in the Abundance of Arctic Cisco in the Colville River: Analysis of Existing Data and Local Knowledge. Prepared for the U.S. Department of the Interior, Minerals Management Service. Outer Continental Shelf Study MMS 2001-042, Anchorage, AK.

Alaska Bureau of Vital Statistics (ABVS). 2007. Alaska Bureau of Vital Statistics 2007 Annual Report. Department of Health and Social Services, Division of Public Health, Bureau of Vital Statistics, Juneau, Alaska: [http://www.hss.state.ak.us/dph/bvs/data/default.htm]

________. **2008.** Data and Statistics. State of Alaska Department of Health and Social Services, Division of Public Health, Section of Epidemiology: [http://www.hss.state.ak.us/dph/bvs/data/default.htm]

Alaska Climate Research Center (ACRC). 2004. University of Alaska Fairbanks. [http://climate.gi.alaska.edu/ClimTrends/]

Alaska Climate Change Strategy's Mitigation Advisory Group (MAG). 2009. Final Report: Greenhouse Gas Inventory and Forecast and Policy Recommendations Addressing Greenhouse Gas Reduction in Alaska.

Alaska Consultants Inc. (ACI) and SRBA. 1984. Subsistence Study of Alaska Eskimo Whaling Villages. Prepared for U.S. Department of the Interior, Anchorage, Alaska.

Alaska Climate Change Sub-Cabinet. 2012. State of Alaska, Climate Change in Alaska website, Accessed May 2012, Available at: http://www.climatechange.alaska.gov.

Alaska Department of Commerce and Economic Development (ADCED). 2003. Alaska Community Database, Community Information Summaries for Barrow, Atqasuk, Anaktuvuk Pass, and Nuiqsut. Alaska Department of Commerce and Economic Development, http://www.commerce.state.ak.us/dca/commdb/CF_COMDB.htm.

________. **2010.** National Petroleum Reserve – Alaska (NPR-A) Impact Mitigation Grant Program Report to the Second Session of the Twenty-Sixth Alaska Legislature http://www.commerce.state.ak.us/dca/pub/2010_Report_to_the_Legislature.pdf

________. **2010.** Alaska Community Database Community Information Summaries (CIS). Division of Community & Regional Affairs: [http://www.commerce.state.ak.us/dcra/commdb/CIS.cfm]

________. **2011.** Alaska Community Database. http://www.commerce.state.ak.us/dca/commdb/CIS.cfm

Alaska Department of Education and Early Development. (EED). 2005. Youth Risk Behavior Survey.

________. **2009.** Statistics and Reports. Report Card to the Public 2008-2009. Juneau, Alaska: [http://www.eed.state.ak.us/reportcard/rc08.html]

Alaska Department of Environmental Conservation (ADEC). 2010. Air Quality Regulations (8ACC 50.010 (1), Ambient Air Quality Standards for Particulate Matter, as amended through Dec. 9.

________. **2010.** State Air Quality Control Program: Appendix III.K.3, *Overview of Alaska and Air Quality* (public review draft).

Alaska Department of Fish and Game (ADFG). 1991. Blasting Standards for the Protection of Fish. http://www.adfg.alaska.gov/static/license/uselicense/pdfs/adfg_blasting_standards.pdf.

________. **1993.** North Slope Gravel Pit Performance Guidelines, Alaska Department of Fish and Game, Habitat and Restoration Division, Technical Report No. 93-9

________. **1996.** Community Profile Database. Update to Volume 5, Arctic Region Alaska Department of Fish and Game, Division of Subsistence, Juneau, Alaska.

________. **2000.** Subsistence in Alaska: A Year 2000 Update, Juneau, Alaska.

________. **2001.** Community Profile Database. Version 3.11, Juneau, Alaska.

________. **2002.** Western Arctic Caribou Herd Cooperative Management Plan, 2001-2012. Public Review Draft. In Alaska Department of Fish and Game [ed.], Fairbanks, Alaska

________. **2008.** Professional Publication No. 08-01, Economic Impacts and Contributions of Sportfishing in Alaska, 2007.

________. **2010a.** Anadromous Waters Catalog. Alaska Department of Fish and Game, Division of Sport Fish. Worldwide web address: http://www.adfg.alaska.gov/index.cfm?adfg=maps.interactive

________. **2010b.** Dolly Varden and Arctic Char in Northern Alaska. Alaska Department of Fish and Game, Division of Sport Fish. Worldwide web address: http://www.sf.adfg.state.ak.us/Static/Region3/PDFs/arcticchardollyvarden.pdf.

____. **2010.** Harvest Information http://www.wildlife.alaska.gov/index.cfm. October 19, 2010.

________. **2011a.** Anadromous Waters Catalog. Alaska Department of Fish and Game, Division of Sport Fish. http://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?adfg=maps.interactive.

________. **2011b.** North Slope Mine Site Studies. http://www.adfg.alaska.gov/index.cfm?adfg=habitatresearch.northslopemine.

________. **2011c.** News Release, March 24, 2011.

Alaska Department of Health and Social Services, (ADHSS). 2005. Epidemiology Section. The Prevalence of Diabetes among Adult Alaskans, 2002-2004. Epidemiology Bulletins 9(3): 1–8.

________. **2007.** Health Planning and Systems Development. Alaska Health Care Data Book: Selected Measures. Juneau, Alaska.

________. **2008a.** Division of Public Health, Emergency Programs. Alaska Trauma Registry. Anchorage Alaska. Data provided upon request to the NSB.

________. **2008b.** Section of Chronic Disease Prevention and Health Promotion. Food Insecurity in Alaska. Chronicles 1(4): [http://dhss.alaska.gov/dph/Chronic/Documents/Publications/assets/ChroniclesV1-4.pdf]

Alaska Department of Labor and Workforce Development (ADOLWD). 2010. Alaska Local and Regional Information. http://live.laborstats.alaska.gov/alari/

________. **2011.** Alaska Census & Geographic Information Network. [http://labor.alaska.gov/research/census/]; accessed 8/26/2011

________. **2011a.** Monthly Employment Statistics website, Northern Region, 2001 to present (Excel file). Accessed 11/11/2011 [http://live.laborstats.alaska.gov/ces/]

________. **2011b.** Economic Regions and Boroughs, Population data current estimates, Age and Sex, 2000-2010. Accessed on 10/28/2011 at: http://labor.alaska.gov/research/pop/popest.htm.

Alaska Department of Natural Resources (ADNR). 1997. Historical and Projected Oil and Gas Consumption. Alaska Department of Natural Resources, Anchorage, Alaska.

________. **2000.** 2000 Annual Report. Alaska Department of Natural Resources, Division of Oil and Gas, Anchorage, Alaska.

________. **2001a.** Summary of State Competitive Lease Sales. Division of Oil and Gas, Department of Natural Resources, State of Alaska.

________. **2003.** Alaska Oil and Gas Report. December 2003. Oil and Gas Division, Anchorage, Alaska.

________. **2006.** Environmental Report: Eastern North Slope Oil and Gas Pipelines, Feb. 2, 2006.

________. **2010.** Legal and policy guidelines governing management of submerged lands and public waters: public trust doctrine. Alaska Department of Natural Resources, Mining, Land, and Water, State Policy on Navigability. Worldwide web address: [http://dnr.alaska.gov/mlw/nav/nav_policy.htm]

________. **2011.** Division of Oil and Gas. Funds received from oil and gas leases. http://www.dog.dnr.alaska.gov/

________. **2011.** *Alaska Heritage Resource Survey*. Alaska Department of Natural Resources, Office of History and Archaeology, Anchorage, Alaska.

________. **2012.** Alaska Oil and Gas Conservation Commission (AOGCC). Online Public Databases. Alaska Well Files. Available at: http://doa.alaska.gov/ogc/publicdb.html.

Alaska Department of Revenue (ADR), Tax Division. 2010. Oil and Gas Property Tax. State of Alaska Department of Revenue, Tax Division, Anchorage Alaska. http://www.tax.alaska.gov/programs/programs/index.aspx?60018

________. **2011.** Revenue Sources Book, Forecast and Historical Data, Spring 2011. State of Alaska Department of Revenue, Tax Division, Anchorage Alaska. Accessed 11/17/2011. http://www.tax.alaska.gov//programs/documentviewer/viewer.aspx?2321f

Alaska Department of Transportation (AKDOT). 2011. Foothills West Access Transportation Project. Website accessed 29 August 2011. http://foothillsroad.alaska.gov/

Alaska Division of Oil and Gas. 2009. Alaska Oil and Gas Report November 2009, Updated May 2010. Department of Natural Resources, Division of Oil and Gas, State of Alaska: [http://dog.dnr.alaska.gov/Publications/AnnualReports.htm]

Alaska Division of Public Health (ADPH). 2000. Health Status in Alaska. Department of Health and Social Services, Division of Public Health, State of Alaska: [http://www.hss.state.ak.us/dph/targets/hs2000.htm]

________. **2008.** Section of Chronic Disease Prevention and Health Promotion. Food Insecurity in Alaska. Chronicles 1(4): [http://www.hss.state.ak.us/dph/chronic/pubs/assets/ChroniclesV1-4.pdf]

________. **2010.** Healthy Alaskans 2010: Difficult Decisions: Barrow Local Option Stories, Juneau, Alaska.

Alaska Energy Authority (AEA). 2009. A first step toward energy independence.

Alaska Federation of Natives. 2010. The Right to Subsist: Federal Protection of Subsistence in Alaska, pp. 75. Produced by Kathleen Russel Consulting, Anchorage, Alaska.

Alaska Gasline Development Corporation. 2010. Alaska Stand Alone Gas Pipeline Project Bureau of Land Management Federal Grant of Right-of-Way Application. August 2010.

________. **2011a.** Alaska Stand Alone Gas Pipeline/ASAP; Plan of Development Revision 1; March 2011.

________. **2011b.** Alaska Stand Alone Gas Pipeline/ASAP; Project Plan; July 1, 2011.

Alaska Injury Prevention Center (AIPC). 2006. Critical Illness and Trauma Foundation and American Association of Suicidology. Alaska Suicide Follow-back Study Final Report. Anchorage, Alaska.

Alaska Native Epidemiology Center (AN EpiCenter). 2008. Regional Health Profile, Maniilaq Association. Anchorage, Alaska.

________. **2009.** Regional Health Profile, Arctic Slope. Anchorage, Alaska.

Alaska Native Science Commission and the Institute of Social and Economic Research. 2007. Traditional Knowledge and Contaminants Project. University of Alaska, Anchorage, Alaska. Available online at: http://www.iser.uaa.alaska.edu/projects/contam/ResourceGuide/concern_summaries.htm

Alaska Native Tribal Health Consortium [ANTHC]. 2008. Alaska Native Injury Atlas of Mortality and Morbidity. Injury Prevention Program: Anchorage, Alaska [cited 2011 May 4]. Available from: http://www.anthc.org/chs/wp/injprev/injurydata.cfm.

Alaska Network on Domestic Violence and Sexual Assault (ANDVSA). 2004. Domestic Violence Impact and Needs in North Slope Borough Communities Report, January-December 2003. Legal Advocacy Project, ANDVSA, Juneau, Alaska.

Alaska Oil and Gas Association (AOGA). 2001. Alaska's North Slope Oilfields. Technical Briefs. Anchorage, Alaska.

Alaska Oil and Gas Conservation Commission (AOGCC). 2011. Production Data Index. http://doa.alaska.gov/ogc/production/pindex.html.

Alaska Pipeline Project (APP). 2011a. Resource Report No. 1 Preliminary Draft. (USAG-UR-SGREG-OOOOO2). April 2011.

________. **2011b.** Draft Resource Report No. 1. (USAG-UR-SGREG-OOOOO2). December 2011. FERC Docket No. PF09-11-000.

Alaska Process Industry Careers Consortium (APICC). 2011. http://www.apicc.org/

Alaska Regional Response Team. 1994, 2010. Alaska State/Federal Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases, Change 3, January 2010. http://akrrt.org/plans.shtml

Alaska Report. 1996. New North Slope Field (Alpine) Boasts 250-350 Million Barrels in Oil Reserves. Alaska Report 42(41):1-3.

________. **2007.** Digging for Alaska dinosaurs http://alaskareport.com/news1007/do77849_dinosaurs.htm, website accessed September 22, 2011.

Alaska Shorebird Group. 2008. Alaska Shorebird Conservation Plan. Version II. Alaska Shorebird Group, Anchorage, AK.

Albers, P.H. 1980. Transfer of crude oil from contaminated water to bird eggs. Environ. Res. 22:307-314.

Albers, P.H. and M.L. Gay. 1982. Effects of a chemical dispersant and crude oil on breeding ducks. Bull. Environ. Contam. Toxicol. 29(4):404-411.

Albert, T.F. 1979. In: investigation of the occurrence of and behavior patterns of whale in the vicinity of the Beaufort Sea Lease area. J. Kelley and G. Laursen (eds.), p 297-329. Report to BLM from NARL.

________. **1981.** Some thoughts regarding the possible effect of oil contamination on the bowhead whale, *Balaena mysticetus.* In: Tissue Structural Studies and Other Investigations on the Biology of Endangered Whales in the Beaufort Sea, T. Albert (Ed.), pp. 945-953. Report to the Bureau of Land Management, Anchorage, Alaska from the Department of Veterinary Science, University of Maryland, College Park, MD 20742. 953 pp.

Alerstam, T. and A. Lindström. 1990. Bird Migration: Physiology and Ecophysiology. Ornis Scandinavica 22:12-19.

________ **and G.A. Gudmundsson. 1999.** Migration patterns of tundra birds: tracking radar observations along the Northeast Passage. Arctic 52, 346–371.

Alexander, H.L. 1974. The Association of Aurignacoid Elements with Fluted Point Complexes in North America. *In* International Congress on the Prehistory and Paleoecology of Western North American Arctic and Subarctic. S. Raymond and P Scheldermann, eds. Pp. 21-31. Calgary: University of Calgary Archaeological Association.

________. **1987.** Putu: A Fluted Point Site in Alaska. Department of Archaeology Publication, 17. Burnaby: Simon Fraser University.

Allen. B. M. and R. P. Angliss. 2010. Alaska marine mammal stock assessments, 2009. U.S. Dep. Commer., NOAA Tech. Memo. NMFSAFSC-206, 276 p.

________. **2011.** Alaska marine mammal stock assessments, 2010. U. S. Department Commerce, NOAA Technical Memorandum NMFS-AFSC-223. 292 p.

________. **2011.** Alaska marine mammal stock assessments, 2011. U.S. Dep. Commer., NOAA Tech. Memo. NMFS AFSC-234, 288 p.

________. **2011.** Alaska marine mammal stock assessments, 2011. U.S. Dep. Commer., NOAA Tech. Memo. NMFS AFSC-234, 288 p.

Alt, K.T. and D.R. Kogl. 1973. Notes on the Whitefish of the Colville River, Alaska. Journal of the Fisheries Research Board of Canada 30:554-556.

________. **1979.** Contributions to the Life History of the Humpback Whitefish in Alaska. Transactions of the American Fisheries Society 108:156-160.

Altinok, I. and J.M. Grizzle. 2001. Effects of Salinity on *Yersinia ruckeri* Infection of Rainbow Trout and Brown Trout. Journal of Aquatic Animal Health 13(4):334-339.

Alyeska Pipeline Company. 2012. Low Flow Impact Study. Online at http://www.alyeska-pipe.com/TAPS/PipelineOperations/LowFlow

Amstrup, S.C. 1993. Human Disturbance of Denning Polar Bears in Alaska. Arctic 46(3):245-250.

________ **and C. Gardner. 1994.** Polar bear maternity denning in the Beaufort Sea. Journal of Wildlife Management 58:1–10.

_______ **and D.P. DeMaster. 1988.** Polar bear, *Ursus maritimus*. Pages 39-45 in J.W. Lentfer, ed., Selected Marine Mammals of Alaska: Species Accounts with Research and Management Recommendations. Marine Mammal Commission, Washington, D.C.

_______**. 2000.** Polar Bear. In The Natural History of an Oil Field: Development and Biota. Edited by J.C. Truett and S.R. Johnson. Academic Press, Inc., New York, New York, USA pp. 133-157.

_______**. 2003.** Polar Bear (*Ursus maritimus*). Pages 587-610 in Feldhammer, G.A., B.C. Thompson, and J.A. Chapman, eds., Wild Mammals of North America — Biology, Management, and Conservation. John Hopkins University Press. Baltimore, Maryland. pp. 587-610.

_______**, T.L. McDonald, and G. Durner. 2004.** Using satellite radio telemetry data to delineate and manage wildlife populations. Wildlife Society Bulletin. 32(3):661-679.

_______**, G.M. Durner, I. Stirling, and T.L. McDonald. 2005.** Allocating harvests among polar bear stocks in the Beaufort Sea. Arctic. 58:247-259.

_______**, E.T. DeWeaver, D.C. Douglas, B.G. Margot, G.M. Durner, C.M. Bitz, and D.A. Bailey. 2010.** Greenhouse gas mitigation can reduce sea-ice loss and increase polar bear persistence. Nature 468:955-958.

Anderson, B.A. and S.M. Murphy. 1988. Lisburne Terrestrial Monitoring Program - 1986 and 1987. The Effects of the Lisburne Powerline on Birds. Report Prepared by Alaska Biological Research, Inc., Fairbanks, Alaska.

_______**, C.B. Johnson, B.A. Cooper, L.N. Smith, and A.A. Stickney. 1999.** Habitat Associations of Nesting Spectacled Eiders on the Arctic Coastal Plain of Alaska. Pages 27-33 *In*: Behaviour and Ecology of Sea Ducks. R.I. Goudie, M.R. Petersen and G.J. Robertson (eds.). Canadian Wildlife Service Occasional Paper No. 100. Environment Canada, Canadian Wildlife Service, Ottawa, Ontario.

_______**, R.J. Ritchie, A.A. Stickney, and A.M. Wildman. 2000.** Avian Studies in the Kuparuk Oilfield, Report Prepared by Alaska Biological Research, Inc., Fairbanks, Alaska.

Anderson, C.M., M. Mayes, and R. LaBelle. 2012. Update of Occurrence Rates for Offshore Oil Spills. OCS Report BOEM 2012-0069. Herndon, VA: USDOI, BOEM. 87 pp. Available at: http://www.boem.gov/uploadedFiles/BOEM/Environmental_Stewardship/Environmental_Assessment/Oil_Spill_Modeling/AndersonMayesLabelle2012.pdf

_______**, and R.P. LaBelle. 2000.** Update of Comparative Occurrence Rates for Offshore Oil Spills. Spill Science and Technology Bulletin 6(5/6): 303-321.

Anderson, D.D. 1968. A stone age campsite at the gateway to America. *Scientific American* 218(6):24-33.

_______**. 1970.** Akmak: an early archaeological assemblage from Onion Portage, Northwest Alaska. *Acta Arctica* Fasc. 16. Danish Arctic Institute, Copenhagen.

_______. **1984.** Prehistory of north Alaska, pp. 80-93. In D. Damas [ed.], Handbook of North American Indians. Smithsonian Institution, Washington, DC.

Anderson, P., and G. Weller (eds.). 1996. Preparing for an uncertain future: impacts of short- and long-term climate change on Alaska. In Proceedings of a workshop held during the Arctic Science Conference, September 1995, Fairbanks, Alaska. University of Alaska, Center for Global Change and Arctic System Research. Fairbanks Alaska.

Andersson, M. 1973. Birds of Nuvagapak Point, northeastern Alaska. Arctic 26:186-197.

Andres, B. 1989. Littoral zone use by post-breeding shorebirds on the Colville River delta, Alaska. Masters of Science Thesis, Ohio State University, Columbus, Ohio. 116 pp.

_______. **1994.** Coastal Zone Use by Post-breeding Shorebirds in Northern Alaska. Journal of Wildlife Management 58: 206-213.

_______. **2004.** Density of Shorebirds Breeding in the National Petroleum Reserve-Alaska. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Denver, Colorado.

Angerbjorn, A., B. Arvidson, E. Noren, and L. Stromgren. 1991. The effect of winter food on reproduction in the Arctic fox, *Alopex lagopus*: A field experiment. J. Animal Ecology 60:705-714.

Angliss, R. P. and K. L. Lodge. 2002. Alaska Marine Mammal Stock Assessments, 2002. National Oceanic and Atmospheric Administration Technical Memorandum NMFS-AFSC-133. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, National Marine Mammal Laboratory, Seattle, Washington.

_______ **and R. Outlaw. 2005.** Draft Alaska Marine Mammal Stock Assessments 2005. Report SC-CAMLR-XXIV. Seattle, WA. National Marine Mammal Lab, Alaska Fisheries Center.

_______ **and R. Outlaw. 2008.** Alaska marine mammal stock assessments, 2005. NOAA Technical Memorandum NMFS-AFSC-161.

_______ **and B.M. Allen. 2009.** Alaska marine mammal stock assessments, 2008. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-193. 258 p.

Anonymous. 2002. "The Lakeview Gusher". San Joaquin Geological Society. Archived from the original on 2006-10-19. Available at: http://www.sjgs.com/lakeview.html. Retrieved 11 June 2010.

Arctic Climate Impact Assessment (ACIA). 2004. Impacts of a warming arctic: Arctic Climate Impact Assessment. Overview Report. Cambridge University Press. http://www.acia.uaf.edu.

_______. **2005.** Impacts of a Warming Arctic: Arctic Climate Impact Assessment. Scientific Report.

Arctic Council. 2009. Arctic Marine Shipping Assessment 2009 Report. April 2009, second printing. Available from: http://www.institutenorth.org/assets/images/uploads/articles/AMSA_2009_Report_2nd_print.pdf

Arctic Environmental Information and Data Center. 1979. University of Alaska. 1979. Mineral terranes of Alaska - 1979 Series. Published by U.S. Bureau of Mines. 6 map sheets, scale 1:1,000,000.

________**. 1982,** Mineral terranes of Alaska; 1982: Research and display by C.C. Hawley and Associates, prepared and published by Arctic Environmental Information and Data Center, University of Alaska, 6 plates.

Arctic Monitoring and Assessment Programme. 1997. Arctic Pollution Issues: A State of the Arctic Environment Report. Oslo, Norway.

________**. 2002.** Arctic Monitoring and Assessment Programme, 2002. Published by: AMAP, P.O. Box 8100 Dep., n-0032 Oslo, Norway.

Arctic Slope Native Association. 2010. Samuel Simmonds Memorial Hospital. [http://www.arcticslope.org/index.html]

Arctic Slope Regional Corporation website. 2011. Arctic Slope Regional Corporation website, http://www.asrc.com/Pages/Home.aspx.

ARCO Alaska, Inc. 1999. Oil Discharge Prevention and Contingency Plan, Alpine Development Participating Area North Slope Area. ARCO Alaska, Inc., Anchorage, Alaska.

Armstrong, R.H. 1986. A Review of Arctic Grayling Studies in Alaska, 1952-1982. Biological Papers of the University of Alaska 23:3-17.

Arnold, T.G. 2006. The Ice-Free Corridor: Biogeographical Highway or Environmental Cul-De-Sac. PhD. Thesis, Simon Fraser University, Burnaby, B.C., Canada

Arp, C.D. and B.M Jones. 2009. Geography of Alaska Lake Districts: Identification, Description, and Analysis of Lake-Rich Regions of a Diverse and Dynamic State. U.S. Geological Survey Scientific Investigations Report 2008-5215.

________**, B.M. Jones, M. Whitman, A. Larsen, and F.E. Urban. 2010.** Lake Temperature and Ice Cover Regimes in the Alaskan Subarctic and Arctic: Integrated Monitoring, Remote Sensing, and Modeling. Journal of the American Water Resources Association 46(4):777-791.

Arthur, S.M. and P.A. Del Vecchio. 2006. Effects of oil field development on calf growth and survival in the Central Arctic caribou herd. Abstract. 13th Annual Conference, The Wildlife Society, Anchorage, Alaska.

Arvey, W.D. 1991. Stock Status of Anadromous Dolly Varden in Waters of Alaska's North Slope. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Manuscript No. 91-3.

Ashjian, C.J., S.R. Braund, R.G. Campbell, [and others]. 2010. Climate variability, oceanography, bowhead whale distribution and Iñupiat subsistence whaling near Barrow, Alaska. Arctic VOL. 63, NO. 2 (JUNE 2010) P. 179–194.

ASRC Energy Services. 2007. Renaissance Umiat, LLC, Lake Studies Report, Northeast NPR-A Leases. Prepared for Renaissance Umiat, LLC, Anchorage, AK.

Attanasi, E.D. and F.A. Freeman. 2011. Economic Analysis of the 2010 Geological Survey Assessment of Undiscovered Oil and Gas in the National Petroleum Reserve in Alaska; U.S. Department of the Interior, U.S. Geological Survey Open-File Report 2011-1103. Available only online at http://pubs.usgs.gov/of/2011/1103.

Auerbach, N.A., M.D. Walker, and D.A. Walker. 1997. Effects of Roadside Disturbance on Substrate and Vegetation Properties in Arctic Tundra. Ecological Applications 7(1):218-235.

Austin, J.E. and M.R. Miller. 1995. Northern Pintail (*Anas acuta*). In The Birds of North America, No. 163 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

Avery, M.L., P.F. Springer, and N.S. Dailey. 1980. Avian mortality at man-made structures: an annotated bibliography (revised). U.S. Fish Wildl. Serv. FWS/OBS-80/54, 152 pp.

Babaluk, J.A., J.D. Reist, J.D. Johnson, and L. Johnson. 2000. First Records of Sockeye Salmon (*Oncorhynchus nerka*) and Pink Salmon (*O. gorbuscha*) from Banks Island and Other Records of Pacific Salmon in Northwest Territories, Canada. Arctic 53(2): 161-164.

Bacon, G.L. 1975. Trans Alaska Pipeline Project field notes.

Bacon, J., T. Hepa, H.J. Brower, M. Pederson, T. Olemaun, J. C. George, B. Corrigan, NSB Dept. of Wildlife Management, Native Village of Barrow, and Corrigan Associates. 2009. Estimates of Subsistence Harvest for Villages on the North Slope of Alaska, 1994-2003. North Slope Borough Department of Wildlife Management, Barrow, Alaska.

Baggett H.C., A. Parkinson, P.T. Muth, B.D. Gold, and B.D. Gessner. 2006. Endemic Iron Deficiency Associated With Helicobacter pylori Infection Among School-Aged Children in Alaska. Pediatrics 117(3):e396-e404.

Bailey, A.M. 1948. Birds of Arctic Alaska. Popular Series, Number 8. The Colorado Museum of Natural History.

Bain, D.E. and R.W. Williams. 2006. Long range effects of airgun noise on marine mammals: Responses as a function of received sound level and distance. Paper presented to the International Whaling Commission Scientific Committee, SC/58/E35.

Balogh, G. 1997. Spectacled Eiders: Threatened Seaduck on the National Petroleum Reserve – Alaska. National Petroleum Reserve – Alaska Symposium Proceedings: Science, Traditional Knowledge, and the Resources of the Northeast Planning Area of the National Petroleum Reserve – Alaska, April 16-18, 1997, Anchorage, Alaska.

Baker (Michael Baker Jr., Inc). 2002. NPR-A 2002 Lake Monitoring and Recharge Study. Michael Baker Jr., Inc. Report 25288-MBJ-DOC-001. Prepared for ConocoPhillips, Alaska, Inc., Anchorage, Alaska.

________. 2007. 2007 Colville River Delta Lakes Recharge Monitoring and Analysis. Report 110919-MBJ-RPT-001, prepared for ConocoPhillips Alaska, Anchorage.

Ballard, W.B., M.A. Cronin, R. Rodrigues, R.O. Skoog, and R.H. Pollard. 2000. Arctic fox, *Alopex lagopus*, den densities in the Prudhoe Bay Region, Alaska. Canadian Field-Naturalist 114:453-456.

________, M.A. Cronin, and H.A. Whitlaw. 2000. Caribou and Oil Fields. In J. C. Truett and S. R. Johnson [eds.], The Natural History of an Arctic Oil Field: Development and the Biota. Academic Press, San Diego, California.

Ballew, C. and A.R. Tzilkowski. 2006. The contribution of subsistence foods to the total diet of Alaska Natives in 13 rural communities. Ecology of Food and Nutrition 45(1): 1-26.

________, A. Ross, R.S. Wells, V. Hiratsuka, K.J. Hamrick, E.D. Nobmann, E.D. and S. Bartell. 2004. Final Report on The Alaska Traditional Diet Survey. Alaska Native Epidemiology Centre, Alaska Native Health Board, Anchorage, Alaska.

Banet, A.C., Jr. 1991. Oil and Gas Development on Alaska's North Slope: Past Results and Future Prospects. BLM-Alaska Open File Report 34. March 1991.

Barber, W.E., L.L. McDonald, W.P. Erickson, and M. Vallarino. 1995. Effects of the Exxon Valdez Oil Spill on Intertidal Fish: a Field Study. Transactions of the American Fisheries Society 124(4):461-476.

Barber V. 2010. Thawing Arctic ice cellars worry coastal Alaska villagers. Anchorage Daily News, June 14, 2010.

Barlow, J., K.A. Forney, P.S. Hill, R.L. Brownell, Jr., [and others]. 1997. U.S. Pacific marine mammal stock assessments: 1996. NOAA Technical Memorandum NMFS NOAA-TM-NMFS-SWFSC-248. National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22167. 223 pp.

Barnes, P.W., D.M. Schell, and E. Reimnitz (eds). 1984. The Alaskan Beaufort Sea, Ecosystems, and Environments. Academic Press, Inc., New York, New York.

Barr, J.F., C. Eberl, and J.W. McIntyre. 2000. Red-throated Loon (*Gavia stellata*). *In*: The Birds of North America, Number 513 (A. Poole and F. Gill, eds). The Birds of North America, Inc., Philadelphia, PA.

Barrett, S.; D. Havlina, J. Jones, J., [and others]. 2010. Interagency Fire Regime Condition Class Guidebook. Version 3.0 [Homepage of the Interagency Fire Regime Condition Class website, USDA Forest Service, U.S. Department of the Interior, and The Nature Conservancy]. [Online], Available: http://www.frcc.gov.

Barron T., M. Orenstein, and A. Tamburrini. 2010. Health Effects Assessment Tool (HEAT): An Innovative Guide for HIA in Resource Development Projects.

Barrow Arctic Science Consortium. 2007. Website for the not-for-profit organization for support of research and education involving Alaska's North Slope and Chukotka, Russia. Available online at: http://www.arcticscience.org/newfac.php

Barsdate, R.J., M.C. Miller, V. Alexander, J.R. Vestal, and J.E. Hobbie. 1980. Oil Spill Effects. In Limnology of Tundra Ponds. Dowden, Hutchinson and Ross, Inc., Stroudberg, Pennsylvania.

Bart, J. 1977. The Impact of Human Visitation on Avian Nesting Success. Living Bird 16:187-192.

_____ and S.L. Earnst. 2005. Breeding ecology of spectacled eiders *Somateria fischeri* in northern Alaska. Wildfowl 55:85-100.

Bartels, R.F. and W.J. Zellhoefer. 1983. Migratory bird use of the coastal lagoon system of the Beaufort Sea coastline within the Arctic National Wildlife Refuge, Alaska, 1981 and 1982. Pages 61-75 in G. W. Garner and P. E. Reynolds (eds.), 1982 update report, baseline study of fish, wildlife, and their habitats. U.S. Fish and Wildlife Service, Anchorage, Alaska.

Barter, M. 2003. The Yellow Sea—a race against time. Wader Study Group Bull. 100:111–113.

Battelle. 2006. Beaufort Sea Anadromous Overwintering Fish Habitat. Interim Report PNWD-360, Limited Distribution. Prepared for USDOI Minerals Management Service, Contract No. 0103CT72732.

Batzli, G.O., R.G. White, S.F. MacLean Jr., F.A. Pitelka, and B.D. Collier. 1980. The Herbivore-based Trophic System. *In* An Arctic Ecosystem: The Coastal Tundra at Barrow, Alaska. J. Brown, P.C. Miller, L.L. Tieszen, and F.L. Bunell (eds.). U.S./IBP Synthesis Series 12. Dowden, Hutchinson, and Ross, Inc., Stroudsberg, Pennsylvania.

Beauchamp, D.A. 1990. Movements, Habitat Use, and Spawning Strategies of Arctic Grayling in a Subalpine Lake Tributary. Northwest Science 64(4):195-207.

Beaver, M.R. 2006. Rethinking the Putu Site: Results of a Spatial Analysis of a Fluted Point Site in Northern Alaska. *Arctic Anthropology*, 43(1): 20-39.

________. 2008. Distinguishing Holocene Microblades from a Paleoindian Component at the Mesa Site, Alaska. *Journal of Field Archaeology* 33: 133-150.

Bechard, M.J. and T.R. Swem. 2002. Rough-legged Hawk (*Buteo lagopus*). *In* The Birds of North America, No. 641 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Becker, C.D. and M.G. Wohlford. 1980. Thermal Resistance of Juvenile Salmonids Sublethally Exposed to Nickel, Determined by the Critical Thermal Maximum Method. Environmental Pollution 21A(3):181-189.

Becker PR. 2000. Concentration of Chlorinated Hydrocarbons and Heavy Metals in Alaska Arctic Marine Mammals. Marine Pollution Bulletin 40(10): 819-829.

Bee, J.W., and E.R. Hall. 1956. Mammals of northern Alaska on the Arctic Slope. Museum of Natural History Miscellaneous Publication 8. University of Kansas, Lawrence, Kansas.

Behr-Andres, C., J. Conn, S. Forester, and J. Wiegers. 2001. Tundra Spill Cleanup and Remediation Tactics: A Study of Historic Spills and Literature. AMEC Earth and Environmental and Alaska Department of Conservation.

Beikman, H.M., compiler. 1980. Geologic map of Alaska: U.S. Geological Survey Map SG0002-1T and 2T, Scale 1:2,500,000.

Beitinger, T.L., and L.C. Fitzpatrick. 1979. Physiological and Ecological Correlates of Preferred Temperature in Fish. American Zoologist 19:319-329.

Belanger, L. and J. Bedard. 1989. Responses of Staging Greater Snow Geese to Human Disturbance. Journal of Wildlife Management 53(3):713-719.

Belcourt-Dittloff, A. 2006. Resiliency and risk in Native American communities: A culturally informed investigation. Convention of the Association for Behavioral and Cognitive Therapies, Chicago, IL.

Bellrose, F.C. 1976. Ducks, Geese, and Swans of North America. Stackpole Books, Harrisburg, Pennslyvania.

Bendock, T.N. 1976. De-watering Effects of Industrial Development on Arctic Fish. Unpublished Report for the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Sport Fish, Fairbanks, AK. Page 18 In J.F. Winters, P.K. Weber, A.L. DeCicco, and N. Shishido. 1988. An Annotated Bibliography of Selected References of Fishes of the North Slope, Alaska, with Emphasis on Research Conducted in National Petroleum Reserve – Alaska. Prepared by Alaska Department of Fish and Game, Divisions of Habitat and Subsistence, Juneau, AK. Prepared for North Slope Borough, Barrow, AK.

________. **1979a.** Inventory and Cataloging of Arctic Area Waters. Alaska Department of Fish and Game, Division of Sport Fish. Annual Performance Report, Study No. G-I-I, Volume 20.

________. **1979b.** Beaufort Sea Estuarine Fishery Study. In Environmental Assessment of the Alaskan Continental Shelf. Final Report, Volume 4. U.S. Department of Interior, Bureau of Land Management, and U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Outer Continental Shelf Environmental Assessment Program.

________. **1980.** Inventory and Cataloging of Arctic Area Waters. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980. Project F-9-12, 21(G-I-I), Juneau.

________. **1982.** Inventory and Cataloging of Arctic Area Waters. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982. Project F-9-14, 23(G-I-I), Juneau.

________. 1983. Inventory and Cataloging of Arctic Area Waters. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983. Project F-9-15, 20(G-I-I), Juneau.

________ and J.M. Burr. 1984. Freshwater Fish Distributions in the Central Arctic Coastal Plain (Ikpikpuk River to Colville River). State of Alaska, Department of Fish and Game, Division of Sport Fish, Fairbanks, AK.

Bengtson, J.L., L.M. Hiruki-Raring, M.A. Simpkins, and P.L. Boveng. 2005. Ringed and bearded seal densities in the eastern Chukchi Sea, 1999–2000. Polar Biol. 28: 833–845.

Bent, A.C. 1987. Life Histories of North American waterfowl. Dover Publications, Inc., New York.

Bente, P. 1998. Game Management Unit 26A: Western North Slope. in Federal Aid in Wildlife Restoration Grant W-27-1, Wolf, M.V. Hicks (ed.). Alaska Dept. of Fish and Game, Juneau, Alaska.

Bercha Group Inc. 2006. Alternative Oil Spill Occurrence Estimator sand their Variability for the Chukchi Sea - Fault Tree Method. OCS Study MMS 2006-033. Anchorage, AK: USDOI, MMS, Alaska OCS Region, unpaginated.

________. 2008a. Alternative Oil Spill Occurrence Estimators and their Variability for the Chukchi Sea - Fault Tree Method. OCS Study MMS 2008-035. Anchorage, AK: USDOI, MMS, Alaska OCS Region, 322 pp.

________. 2008b. Alternative Oil Spill Occurrence Estimators and their Variability for the Beaufort Sea - Fault Tree Method. OCS Study MMS 2008-036. Anchorage, AK: USDOI, MMS, Alaska OCS Region, 342 pp.

Bergerud, A.T. 1974. The role of the environment in the aggregation, movement, and disturbance behavior of caribou. In The Behavior of Ungulates and its Relation to Management, V. Geist and F. Walter, eds. Vol. 2. New Series, No. 2. Gland, Switzerland: International Union for the Conservation of Nature, pp. 552-584.

________ and J.P. Elliot. 1986. Dynamics of caribou and wolves in northern British Columbia. Canadian Journal of Zoology 64:1515-1529.

________. 1987. An assessment of petroleum on the status of the Porcupine Caribou Herd. In Arctic National Wildlife Refuge, Alaska Coastal Plain Resource Assessment. Report and Recommendation to the Congress of the U.S. and Final Legislative Environmental Impact Statement. Vol. 2, Appendix, Public Comments and Responses. Washington, D.C.: USDOI, FWS, pp. 4-19.

Bergman R.D., R.L. Howard, K.F. Abraham, and M.W. Weller. 1977. Water Birds and Their Wetland Resources in Relation to Oil Development at Storkerson Point, Alaska. Resource Publication 129. U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region.

Bersamin, A., B.R. Luick, E. Ruppert, J.S. Stern, and S. Zidenberg-Cherr. 2006. Diet quality among Yup'ik Eskimos living in rural communities is low: the Center for Alaska Native Health Research Pilot Study. J Am Diet Assoc. 106(7):1055-63.

_______ **and Luick, B.R. 2007.** Nutrient intakes are associated with adherence to a traditional diet among Yup'ik Eskimos living in remote Alaska Native Communities: The CNHR Study. International Journal of Circumpolar Health, 66(1): 62-70.

_______**, B.R. Luick, I.B. King, J.S. Stern, and S. Zidenberg-Cherr. 2008.** Westernizing diets influence fat intake, red blood cell fatty acid composition, and health in remote Alaskan Native communities in the center for Alaska Native health study. J Am Diet Assoc. 108(2):266-73.

Bickham, J.W., J.C. Patton, S. Minzenmayer, L.L. Moulton, and B.J. Gallaway. 1997. Identification of Arctic and Bering Ciscoes in the Colville River Delta, Beaufort Sea Coast, Alaska. Pages 224-228. In: Fish Ecology in North America, J.B. Reynolds, ed. American Fisheries Society, Bethesda, Maryland.

Bigg, M.A., P.F. Olesiuk, G.M. Ellis, J.K.B. Ford, and K.C. Balcomb, III. 1990. Social organization and genealogy of resident killer whales (*Orcinus orca*) in the coastal waters of British Columbia and Washington State. Pp. 386-406 *In* P. S. Hammond, S. A. Mizroch, and G. P. Donovan (eds.), Individual recognition of cetaceans: use of photo-identification and other techniques to estimate population parameters. Rep. Int. Whal. Comm. (Special Issue) 12.

Billings, W.D. and K.M. Peterson. 1980. Vegetational Change and Ice-wedge Polygons Through the Thaw-Lake Cycle in Arctic Alaska. Arctic and Alpine Research 12:413-432.

_______**, Luken, J.O., Mortensen, D.A., and K.M. Peterson. 1983.** Increasing atmospheric carbon dioxide: possible effects on arctic tundra. Oecologia 58:286-289.

_______**. 1984.** Interaction of Increasing Atmospheric Carbon Dioxide and Soil Nitrogen on the Carbon Balance of Tundra Microcosms. Oecologia 65: 26-29.

_______**. 1987.** Constraints to Plant Growth, Reproduction, and Establishment in Arctic Environments. Arctic and Alpine Research 19:357-365.

Birch, H., Bittner and Cherot. 1997. Prepared for and funded by the North Slope Borough. Threats to the Health and Environment of Alaska Natives in the Nuclear Age: The U.S. Government's Treatment of Alaska Native Research Subjects in a Thyroid Function Study Involving the Administration of Radioactive Iodine-131, Anchorage, Alaska

Bird, K.J. 1988. Geology, play descriptions, and petroleum resources of the Alaskan North Slope (petroleum provinces 58-60): U.S. Geological Survey Open-File Report 88-450-Y, 52 p.

_______**. 1991.** North Slope of Alaska. In: Economic Geology, H.J. Gluskoter, D.D. Rice, and R.B. Taylor, eds. Vol. P-2. Boulder, CO: The Geologic Society of America.

_______ **and C.M. Molenaar. 1992.** The North Slope Foreland Basin, Alaska. In: Foreland Basins and Foldbelts, R. Macqueen and D. Leckie, eds. Memoir 55. American Association of Petroleum Geologists, pp. 363-393.

_______ **and Houseknecht, D.W. 2002.** U. S. Geological Survey 2002 Petroleum Resource Assessment of the National Petroleum Reserve Alaska (NPR-A): U. S. Geological Survey, USGS Fact Sheet 045-02, 6 p.

Bjerregaard, P. 2001. Rapid Socio-cultural change and health in the Arctic. Int J Circumpolar Health 60(2): 102-111.

_______**, Jorgensen, M.E., and K. Borch-Johnsen. 2004.** Serum lipids of Greenland Inuit in relation to Inuit genetic heritage, westernization and migration. Atherosclerosis 174(2): 391-398.

_______**, Young, T.K., Dewailly, E., and S.O. Ebbesson. 2005.** Review Article: Indigenous health in the Arctic: an overview of the circumpolar Inuit population. Scand J Public Health 33: 241-242.

Bjornn, T.C. and D.W. Reiser. 1991. Habitat Requirements of Salmonids in Streams. Pages 83-138. In: Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats, W.R. Meehan, ed. American Fisheries Society Special Publication 19.

Bjørge, A. and K.A. Tolley. 2009. Harbor porpoise *Phocoena phocoena.* In: Perrin WF, Würsig B, and Thewissen HGM (eds.), Encyclopedia of Marine Mammals 2nd ed. Academic Press, San Diego, CA. 1316 p.

Blackman, B.G. 2002. Radio Telemetry Studies of Arctic Grayling Migrations to Overwinter, Spawning and Summer Feeding Areas in the Parsnip River Watershed 1996-1997. Peace/Williston Fish and Wildlife Compensation Program, Report No. 263, Prince George, B.C.

Blackwell, S.B., J.W. Lawson, and M.T. Williams. 2004. Tolerance by ringed seals (*Phoca hispida*) to impact pipe-driving and construction sounds at an oil production island. J. Acoust. Soc. Am. 115 (5):2346-2357.

Blees, M.K., K.G. Hartin, D.S. Ireland, and D. Hannay (eds). [Internet]. 2010. Marine Mammal Monitoring and Mitigation During Open Water Seismic Exploration by Statoil USA E&P Inc. in the Chukchi Sea, August- October 2010: 90-day Report. LGL Report P1119. Rep. from LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. for Statoil USA E&P Inc., National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 102 p. + appendices. Anchorage, AK: USDOI, FWS. Available from: http://www.nmfs.noaa.gov/pr/pdfs/permits/2010_statoil_90day_report.pdf.

Bliss, L.C. 2000. Arctic Tundra and Polar Desert Biome. Chapter 1 In North American Terrestrial Vegetation, M.G. Barbour and W.D. Billings (eds.). Cambridge University Press, Cambridge, United Kingdom.

_______**, and R.W. Wein. 1972.** Plant Community Reponses to Disturbances in the Western Canadian Arctic. Canadian Journal of Botany 50:1097-1109.

Bloom. 1980. Field Report, Geophysical survey Story Creek and Drenchwater Creek prospects, July, August 1980, 8 p., 2 maps

Boarman, W.I. and B. Heinrich. 1999. Common Raven (*Corvus corax*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/476 doi:10.2173/bna.476

Bockstoce, J.R. 1978. History of Commercial Whaling in Arctic Alaska. *Alaska Geographic* 54:17-26.

_______, **M. Freeman, W. Laughlin, W. Nelson, M. Orbac, R. Peterson, J. Taylor, and R. Worl. 1979.** Report of the Panel to Consider Cultural Aspects of Aboriginal Whaling in North America. International Whaling Commission, Seattle, Washington.

_______ **and Botkin, D.B. 1983.** The historical status and reduction of the western arctic bowhead whale (*Balaena mysticetus*) population by the pelagic whaling industry, 1848-1914. Report of the International Whaling Commission (Special Issue 5): 107-141.

_______. **1986.** Whales, Ice and Men: The History of Whaling in the Western Arctic. University of Washington Press, Seattle, WA.

_______, **D.B. Botkin, A. Philp, B.W. Collins, and J.C. George. 2005.** The geographic distribution of bowhead whales in the Bering, Chukchi and Beaufort Seas: evidence from whaleship records, 1849-1914. Marine Fisheries Review. 67 (3):1-43.

Bodenhorn, B. 1988. Documenting Inupiat Family Relationships in Changing Times, Volumes I & II. Prepared for the North Slope Borough Commission on Inupiat History, Language and Culture and the Alaska Humanities Forum, Barrow and Anchorage, AK.

_______. **1989.** "The Animals Come to Me, They Know I Share": Iñupiaq Kinship, Changing Economic Relations and Enduring World Views on Alaska's North Slope. PhD Dissertation, University of Cambridge.

_______. **2000.** It's Good to Know Who Your Relatives Are but We Were Taught to Share with Everybody: Shares and Sharing among Iñupiaq Households. *In* G. Wenzel, G. Hovelsrud-Broda and N. Kishigami [eds.], The Social Economy of Sharing: Resource Allocation and Modern Hunter-Gatherers. Senri Ethnological Studies.

Boehm, P.D. 1987. Transport and Transformation Processes Regarding Hydrocarbon and Metal Pollutants in Offshore Sedimentary Environments. Pages 233-286 In Long-Term Environmental Effects of Offshore Oil and Gas Development, D.F. Boesch and N.N. Rabalais (eds.). Elsevier Applied Science, London.

_______, **M.S. Steinhauer, E.A. Crecelius, J. Neff, and C. Tuckfield. 1987.** Analysis of Trace Metals and Hydrocarbons from OSC activities. Final Report on the Beaufort Sea Monitoring Program. Outer Continental Shelf Study MMS 87-0072. U.S. Department of Interior, Minerals Management Service, Anchorage, Alaska.

Bogoslovskaya, L.S., L.M. Votrogov, and I.I. Krupnik. 1982. The Bowhead Whale off Chukotka: Migrations and Aboriginal Whaling. Report of the International Whaling Commission 32:391-399

Bollinger, K.S. and D.V. Derksen. 1996. Demographic characteristics of molting Black Brant near Teshekpuk Lake, Alaska. Journal of Field Ornithology 67:141-158.

Bolotsky, Y.L. and P. Godefoit. 2004. A New Hadrosaurine Dinosaur From the Late Cretaceous of Far Eastern Russia. *Journal of Vertebrate Paleontology* 24(2):351-365.

Bond, W.A. and R.N. Erickson. 1985. Life-History Studies of Anadromous Coregonid Fishes in Two Freshwater Lake Systems on the Tuktoyaktuk Peninsula. Canadian Technical Report of Fisheries and Aquatic Sciences 1336.

Born, E.W., E.W. Born, F.F. Riget, R. Dietz, and D. Andriashek. 1999. Escape responses of hauled out ringed seals (*Phoca hispida*) to aircraft disturbance. Polar Biol. 21(3):171-178.

________, S. Rysgaard, G. Ehlme, M. Sejr, M. Acquarone, and N. Levermann. 2003. Underwater observations of foraging free-living Atlantic walruses (*Odobenus rosmarus rosmarus*) and estimates of their food consumption. Polar Biology 26(5):348-357.

Borough, N.S. 1980. Qiñiqtuagaksrat utuqqanaat iñuuniaġninisiqun: the traditional land use inventory for the mid-Beaufort Sea. North Slope Borough, Commission on History and Culture.

Boveng, P.L., J.L. Bengtson, T.W. Buckley, [and others]. 2008. Status Review of the Ribbon Seal (*Histriophoca fasciata*). NOAA Technical Memorandum NMFS-AFSC-191. Pp 115.

________, J.L. Bengtson, T.W. Buckley, [and others]. 2009. Status Review of the Spotted Seal (*Phoca largha*). NOAA Technical Memorandum NMFS-AFSC-200, Pp 154.

Bowers, P.M. 1982. The Lisburne site: analysis and cultural history of a multi-component lithic workshop in the Iteriak Valley, arctic foothills, northern Alaska. In *Anthropological Papers of the University of Alaska* 20(1-2):79-112.

________. 1983. A Status Report on the Gallagher Flint Station National Historic Landmark. Manuscript on file Bureau of Land Management, Arctic Field Office, Fairbanks.

________. 1999. AMS dating of the Area 22 American PaleoArctic tradition microblade component at the Lisburne site, Arctic Alaska. *Current Research in the Pleistocene* 16.

Boyer, B.B., G.V. Mohatt, R. Plaetke, J. Herron, K.L. Stanhope, C. Stephensen, P.J. Havel, and the CANHR Project Team. 2007. Metabolic syndrome in Yup'ik Eskimos: The Center for Alaska Native Health Research (CANHR) study. Obesity 15: 2535–2540.

Bowden, W.B., M.N. Gooseff, A. Balser, A. Green, B.J. Peterson, and J. Bradford. 2008. Sediment and nutrient delivery from thermokarst features in the foothills of the North Slope, Alaska: Potential impacts on headwater stream ecosystems. Journal of Geophysical Research, Vol. 113, G02026, 12 p.

Bowker, J.M. 2001. Outdoor recreation by Alaskans: projections for 2000 through 2020. Gen. Tech. Rep. PNW-GTR527. Portland, OR:U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station 22 p.

Brabets, T.P. 1996. Evaluation of the Streamflow-gauging Network of Alaska in Providing Regional Streamflow Information. USGS Water Resources Investigation Report 96-4001. U.S. Geological Survey, Anchorage, Alaska.

Bradford, M.J., G.C. Taylor, J.A. Allan, and P.S. Higgins. 1995. An Experimental Study of the Stranding of Juvenile Coho Salmon and Rainbow Trout During Rapid Flow Decreases Under Winter Conditions. North American Journal of Fisheries Management 15:473-479.

Bradstreet, M.S.W. and W.E. Cross. 1982. Trophic Relationships at High Arctic Ice Edges. Arctic 35(1):1-12.

Brady, N.C. and R.R. Weil. 1999. The Nature and Properties of Soils. 12th Edition. Prentice-Hall, Inc, Upper Saddle River, New Jersey.

Braem, N.M., S. Pedersen, J. Simon, D.S. Koster, T. Kaleak, P. Leavitt, J. Patkotak, and P. Neokok. 2010. Monitoring of Annual Caribou Harvests in Three Communities (Atqasuk, Barrow and Nuiqsut) within the National Petroleum Reserve in Alaska: 2003-2007. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 361, Fairbanks, Alaska

Braham, H.W., Fraker, M.A., and Krogman, B.D. 1980. Spring migration of the western arctic population of bowhead whales. Mar. Fish. Rev. 42: 36-46.

________, J.J. Burns, G.A. Fedoseev, and B.D. Krogman. 1984. Habitat portioning by ice-associated pinnipeds: distribution and density of seals and walruses in the Bering Sea, April 1976. Pages 25-47 in F.H. Fay and G.A. Fedoseev, eds. Soviet-American cooperative research on marine mammals. Vol. 1. Pinnipeds. NOAA Tech. Rep. NMFS 12.

________, Krogman, B.D., and G.M. Carroll. 1984. Bowhead and white whale migration, distribution and abundance in the Bering, Chukchi and Beaufort seas, 1975-78. NOAA Technical Report NMFS SSRF-778. National Oceanic and Atmospheric Administration, Rockville, MD. 39 pp. (NTIS PB84-157908).

Brandon, J. and P.R. Wade. 2006. Assessment of the Bering-Chukchi-Beaufort Seas stock of bowhead whales. Journal of Cetacean Research and Management 8(3):225-229.

Braund, S., and Associates. 2010. Subsistence Mapping of Nuiqsut, Kaktovik, and Barrow MMS OCS Study Number 2009-003. United States Department of the Interior Minerals Management Service Alaska OCS Region.

Braune, B.M. and D.G. Noble. 2009. Environmental contaminants in Canadian shorebirds. Environ. Monit. Assess. 148: 185-204.

Brewer, K.M., P. Gallagher, P. Regos, P. Isert, and J. Hall. 1993. ARCO Alaska Incorporated Kuvlum Number 1 Exploration Prospect Site Specific Monitoring Program. Final Report from Coastal and Offshore Pacific Corporation, Walnut Creek, California to ARC Alaska, Inc., Anchorage, Alaska.

Briggs, P.H., J.M. Motooka, E.A. Bailey, [and others]. 1992. Analytical results of soil, stream sediment, panned concentrate, and water samples from the Lik deposit, northwestern Brooks Range, Alaska: U.S. Geological Survey Open-File Report 92-15-A, 53 p. (paper version); 92-15-B

British Petroleum. 2011. BP Statistical Review of World Energy 2011. London: BP.

British Petroleum, Amoco. 1998. "How We Do Business in Alaska" in the Environmental and Social Report. 1998. http://www.bp.com/liveassets/bp_internet/globalbp/STAGING/global_assets/downloads/E/Environmental_and_social_report_1998.pdf

British Petroleum Exploration Alaska. 2000. Oil Discharge Prevention and Contingency Plan, Liberty Development Area, North Slope, Alaska, 6/00, Rev.0. Anchorage, Alaska.

________. **2001.** Database of British Petroleum Exploration Alaska North Slope Oil Spills from October 1999 to December 2001, A. Peloza. Anchorage, Alaska.

________, **and ARCO. 1997.** Arctic Oil: Energy for Today and Tomorrow, BP Exploration (Alaska), Inc. and ARCO Alaska, Inc., Anchorage, Alaska.

Brosge, W.P. and I.L. Tailleur. 1971. Northern Alaska Petroleum Province. In Future Petroleum Provinces of the United States - Their Geology and Potential, I.H. Cram (ed.). Memoir 15. American Association of Petroleum Geologists.

Brouwers, E.M., W.A. Clemens, R.A. Spicer, T. Ager, L.D. Carter, and W.V. Sliter. 1987. Dinosaurs of the North Slope, Alaska: High Latitude, Latest Cretaceous Environments. *Science* 237:1608-1610.

Brower, C.D. 1942. *Fifty Years Below Zero: A lifetime of Adventure in the Far North.* Dodd, Mead and Company, New York.

Brower, A., Sr. 1976. Public Testimony. Federal Energy Hearings, Barrow, Alaska.

Brower, H.K., Jr. and R.T. Opie. 1996. North Slope Borough Subsistence Harvest Documentation Project: Data for Anaktuvuk Pass, Alaska for the period July 1, 1994, to June 30, 1995. North Slope Borough Dept. of Wildlife Management, Barrow, Alaska.

________ **and R.T. Opie. 1997.** North Slope Borough Subsistence Harvest Documentation Project: Data for Nuiqsut, Alaska for the period July 1, 1994, to June 30, 1995. Technical Report. North Slope Borough Dept. of Wildlife Management, Barrow, Alaska.

________ **and R.T. Opie. 1997.** Public Testimony. In National Petroleum Reserve – Alaska, Integrated Activity Plan Environmental Impact Statement, Scoping Hearings, Barrow, Alaska.

________ **and R.T. Hepa. 1998.** North Slope Borough Subsistence Documentation Project: Data for Nuiqsut, Alaska, for the Period July 1, 1994 to June 30, 1995. North Slope Borough, Department of Wildlife Management, Barrow, Alaska.

Brower, T.P. 1980. Qiñiqtuagaksrat Utuqqanaat Iñuuniagninisiqun: The Traditional Land Use Inventory for the Mid-Beaufort Sea. Vol. I. Barrow, AK: North Slope Borough, Commission on History and Culture.

Brown, S., C. Hickey, and B. Harrington (eds.). 2000. The U.S. Shorebird Conservation Plan. Manomet Center for Conservation Sciences, Manomet, Massachusetts.

________**. 2001.** The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.

Brown, W.E. 1979. Nuiqsut Paisangich - Nuiqsut Heritage: A Cultural Plan. Prepared for the Village of Nuiqsut and the North Slope Borough Planning Commission and Commission on History and Culture.

Brubaker, M., J. Bell, and A. Rolin. 2009a. Climate Change Effects on Traditional Inupiaq Food Cellars. Alaska Native Tribal Health Consortium's Center for Climate and Health.

________**, A. Rolin, J. Bell, and J. Warren. 2009b.** Source Drinking Water Challenges Resulting from Changes to an Arctic Tundra Lake. Alaska Native Tribal Health Consortium's Center for Climate and Health.

________**, J. Berner, J. Bell, J. Warren, and A. Rolin. 2010.** Climate Change in Point Hope, Alaska: Strategies for Community Health. ANTHC Center for Climate and Health.

________**, J.Berner, J. Bell and J. Warren. 2011.** Climate Change in Kivalina, Alaska: Strategies for Community Health. ANTHC Center for Climate and Health.

Brueggeman, J.J., B. Watts, M. Wahl, P. Seiser, and A. Cyr. 2009. Marine Mammal surveys at the Klondike and Burger Survey Areas in the Chukchi Sea during the 2008 Open Water Season. Anchorage, AK: ConocoPhillips Alaska, Inc. and Shell Exploration and Production. 45 pp.

Bryner, W.M. 1995. Toward a Group Rights Theory for Remedying Harm to the Subsistence Culture of Alaska Natives. Alaska Law Review 12: 293-294.

Buist, I.A. and D.F. Dickins. 1983. Fate and Behavior of Water-in-oil Emulsions in Ice. In Canadian Offshore Oil Spill Research Association. Report CS 11. Dome Petroleum Ltd., Calgary, Canada.

Burch, E.S., Jr. 1970. The Eskimo Trading Partnership in North Alaska, pp. 49-80, Anthropological Papers of the University of Alaska. University of Alaska, Fairbanks, AK.

________**. 1971.** The Nonempirical Environment of the Arctic Alaskan Eskimos. Southwestern Journal of Anthropology 27: 148-165.

________. **1975.** Eskimo Kinsmen: Changing Family Relationships in Northwest Alaska. West Publishing Co., St. Paul, New York, Boston, Los Angeles, San Francisco.

________. **1975.** Interregional Transportation in Traditional Northwest Alaska. *Anthropological Papers of the University of Alaska* 17(2), 1-11.

________. **1976.** Overland Travel Routes in Northwest Alaska. *Anthropological Papers of the University of Alaska* 18(1), 1-10.

________. **1980.** Traditional Eskimo Societies in Northwest Alaska. In Y. Kotani and W. B. Workman [eds.], Alaska Native Culture and History. SENRI Ethnological Studies 4. National Museum of Ethnology Osaka, Japan.

________. **1998.** The Iñupiaq Eskimo Nations of Northwest Alaska. University of Alaska Press, Fairbanks, Alaska.

Burger, J. 1986. The Effect of Human Activity on Shorebirds in Two Coastal Bays in Northeastern United States. Environmental Conservation 13(2):123-130.

Burgess, R.M. 2000. Arctic fox. In The Natural History of an Arctic Oilfield: Development and the Biota. J.C. Truett and S.R. Johnson, (eds.). Academic Press, New York, New York.

________**, J.R. Rose, P.W. Banyas, and B.E. Lawhead. 1993.** Arctic fox studies in the Prudhoe Bay Unit and adjacent undeveloped areas, 1992. Final report prepared by ABR, Inc., Fairbanks, Alaska, for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

________**, C.B. Johnson, P.E. Seiser, A.A. Stickney, A.M. Wildman, and B.E. Lawhead. 2002.** Wildlife studies in the Northeast Planning Area of the National Petroleum Reserve-Alaska, 2001. Final Report. Prepared by ABR, Inc., Environmental Research and Services, for ConocoPhillips Alaska, Inc., Anchorage, Alaska.

________**, C.B. Johnson, A.M. Wildman, P.E. Seiser, [and others]. 2003.** Wildlife Studies in the Northeast Planning Area of the National Petroleum Reserve – Alaska, 2002. Second Annual Report. Prepared by ABR, Inc., Environmental Research and Services, for ConocoPhillips Alaska, Inc., Anchorage, Alaska.

Burkett E. and J. Piatt. 2008. Kittlitz's murrelet research on Kodiak National Wildlife Refuge in 2008. Unpublished report. USGS, Alaska Science Center, Anchorage, Alaska.

Burns, J.J. 1967. The Pacific bearded seal. Alaska Dep. of Fish and Game, Pittman-Robertson Proj. Rep. W-6-R and W-14-R. Pp. 66.

________. **1970.** Remarks on the distribution and natural history of pagophilic pinnipeds in the Bering and Chukchi seas. J. Mammal. 51: 445-454.

________. **1973.** Marine mammal report. Alaska Dep. Fish and Game, Pittman-Robertson Proj. Rep. W-17-3, W-17-4, and W-17-5.

_______. **1978.** Ice seals. Pages 192-205 in D Haley, ed. Marine mammals. Pacific Search press, Seattle, Wash.

_______. **1981.** Bearded Seals – *Erignathus barbatus* Erxleben, 1777. In: S.H. Ridgway and R.J. Harrison eds. Handbook of marine mammals. Vol. 2. Seals. Academic Press, New York. Pp. 145-170.

_______**, L.H. Shapiro, and F.H. Fay. 1981.** The relationship of marine mammal distribution, densities, and activities to sea ice conditions. U.S. Dep. Commer., NOAA, OCSEAP Environ. Asses. Alaskan Continental Shelf, Final Rep., Biol. Stud. 11:489-670.

_______ **and G.A. Seaman. 1986.** Investigations of belukha whales in coastal waters of western and northern Alaska. II. Biology and ecology. U.S. Department of Commerce, NOAA, OCSEAP Final Report 56:221-357.

_______. **1990.** Proceedings of a Technical Workshop on Fishes Utilized in Subsistence Fisheries in the National Petroleum Reserve – Alaska, October 26-28, 1988, Barrow, Alaska. Report to North Shore Bureau, Department of Wildlife Management, Barrow, Alaska.

Burns, L.E., U.S. Bureau of Land Management, Fugro Airborne Surveys, and Stevens Exploration Management Corp. 2006. Geophysical survey of parts of southern National Petroleum Reserve—Alaska, Northwest Alaska, parts of Howard Pass C-5 and D-5 quadrangles, 12 sheets, various scales 1:31,680.

Bustnes, J.O. and G.H. Systad. 2001. Habitat Use by Wintering Steller's Eiders *Polysticta stelleri* in Northern Norway. Ardea 89(2): 267-274.

Butler, R.B. 1967. More Haskett Point Finds From the Type Locality. *Tebiwa* 10(1):25.

Cade, T.J. 1960. Ecology of the Peregrine and Gyrfalcon Populations in Alaska. Zoology 63:152-290.

_______**, J.L. Lincer, C.M. White, D. G. Roseneau, and L. G. Swartz. 1971.** DDE residues and eggshell changes in Alaskan falcons and hawks. Science 172:955-957.

_______ **and C.M. White. 1973.** Breeding of Say's phoebe in Alaska. Condor 75:360-361.

Calambokidis, J., G.T. Steiger, and L.E. Healey. 1983. Behavior of harbor seals and their reaction to vessels in Muir Inlet, Glacier Bay, Alaska. 5th Biennial Conference on the Biology of Marine Mammals, Boston, MA.

_______**, E.A. Falcone, T.J. Quinn, A.M. Burdin, [and others]. 2008.** SPLASH: Structure of Populations, Levels of Abundance and Status of Humpback Whales in the North Pacific. Final report for Contract AB133F-03-RP-00078 U.S. Dept. of Commerce Western Administrative Center, Seattle, Washington.

Calef, G., E. DeBock, and G. Lortie. 1976. The Reaction of Barren-Ground Caribou to Aircraft. Arctic 29:201-212.

Calain P. 2008. Oil for health in sub-Saharan Africa: health systems in a 'resource curse' environment. Global Health 4: 10.

Callahan, J.E. and G.C. Martin. 1981. Coal occurrences of the Nanushuk Group, western Arctic Alaska - an update, in Rao, P.D., and Wolff, E.N., eds., Focus on Alaska's coal '80, Alaska Coal Conference, 2nd, Fairbanks, October 21-23, 1980, Proceedings: University of Alaska Mineral Industry Research Laboratory Report 50.

Cameron, M.F., J.L. Bengston, P.L. Boveng, [and others]. 2010. Status Review of the Bearded Seal (*Erignathus barbatus*) NOAA Technical Memorandum NMFS-AFSC-211.

Cameron, R.D. 1994. Reproductive Pauses by Female Caribou. Journal of Mammalogy 75:10-13.

_______ **and K.R. Whitten. 1979.** Seasonal movements and sexual segregation of caribou determined by aerial survey. J.Wildl. Manage. 43:626-633.

________**, K.R. Whitten, and W.T. Smith. 1981.** Distribution and Movement of Caribou in Relation to the Kuparuk Development Area. Preliminary Report and Second and Third Interim Reports, 1980- 1981. Alaska Department of Fish and Game, Juneau, Alaska.

________**, K.R. Whitten, and W.T. Smith. 1983.** Responses of Caribou to Petroleum-Related Development on Alaska's Arctic Slope. Federal Aid in Wildlife Restoration Research Program Progress Report, Volume VII, Projects W-21-2 and W-22-1, Job 3, 18R. Alaska Department of Fish and Game, Juneau, Alaska.

________**, D.J. Reed, J.R. Dau, and W.T. Smith. 1992.** Redistribution of Calving Caribou in Response to Oil Field Development on the Arctic Slope of Alaska. Arctic 45(4):338-342.

________**, W.T. Smith, S.G. Fancy, K.L. Gerhart, and R.G. White. 1993.** Calving success of female caribou in relation to body weight. Can. J. Zool. 71:480-486.

_______**, E.A. Lenart, D.J. Reed, K.R. Whitten, and W.T. Smith. 1995.** Abundance and Movements of Caribou in the Oilfield Complex Near Prudhoe Bay, Alaska. Rangifer 15(1):3-8.

________**, D.E. Russell, K.L. Gerhart, R.G. White, and J.J. Ver Hoef. 2000.** A Model for Predicting the Parturition Status of Arctic Caribou. Rangifer 12:1-3.

________**, W.T. Smith, R.G. White, and B. Griffith. 2002.** The Central Arctic Caribou Herd. Part 1 Section 4 In Arctic Refuge Coastal Plain Terrestrial Wildlife Research Summaries, D.C. Douglas and P.E. Reynolds (eds.). Biological Sciences Report USGS/BRD/BSR-2002-0001. U.S. Geological Survey, Biological Resources Division, Anchorage, Alaska.

________**, W.T. Smith, R.G. White, and B. Griffith. 2005.** Central Arctic caribou and petroleum development: distributional, nutritional, and reproductive implications. Arctic 58:1-9.

Cammaert, A.B. 1980. Oil and Gas under Ice Laboratory Study. Report No. RWC17. Canadian Marine Drilling Ltd. and Canada Environmental Protection Service, Ottawa, Ontario.

Campbell, John M. 1961. The Tuktu Complex of Anaktuvuk Pass. *Anthropological Papers of the University of Alaska* 9(1):69-80.

Canadian Environmental Assessment Agency (CEAA). 2010. Report of the Federal Review Panel Established by the Minister of the Environment: Taseko Mines Limited's Prosperity Gold-Copper Mine Project. Ottawa, Ontario.

Cannon, T.C., B.A. Adams, D. Glass, and T. Nelson. 1987. Fish Distribution and Abundance. Chapter 1 in Endicott Environmental Monitoring Program, Final Reports, 1985, Volume 6. Report Prepared by Envirosphere Company for U.S. Army Corps of Engineers, Alaska District, Anchorage, Alaska.

Carls, M.G. and S.D. Rice. 1990. Abnormal Development and Growth Reductions of Pollock, *Theragra chalcogramma*, Embryos Exposed to Water-soluble Fractions of Oil. Fisheries Bulletin 88:29-37.

________**, S.D. Rice, and J.E. Hose. 1999.** Sensitivity of Fish Embryos to Weathered Crude Oil: Part I. Low-level Exposure During Incubation Causes Malformations, Genetic Damage, and Mortality in Larval Pacific Herring (*Clupea pallasi*). Environmental Toxicology and Chemistry 18(3):481-493.

Carmona, R., V. Ayala-Pérez, N. Arce, and L. Morales-Gopar. 2006. Use of Saltworks by Red Knots at Guerrero Negro, Mexico. Wader Study Group Bull. 111: 46–49.

Carpenter, S.R. 2008. Phosphorous Control is Essential to Mitigating Eutrophication. Proceedings of the National Academy of Sciences of the United States of America 105(32):11039-11040.

Carretta, J. V., K. A. Forney, E. Oleson, [and others]. 2011. U.S. Pacific Marine Mammal Stock Assessments: 2010. U. S. Department of Commerce. NOAA Technical Memorandum NMFS-SWFSC-476. 352 pages.

Carroll, G.M. 1992. Teshekpuk Lake Caribou Herd. Survey-inventory Progress Report, 1989-1990. In Caribou. Annual Report of Survey-Inventory Activities, S.M. Abbott (ed.). Federal Aid in Wildlife Restoration Grants W-23-3 and W-23-4. Alaska Dept. of Fish and Game, Juneau, Alaska.

________**. 1995.** Teshekpuk Lake Caribou Herd. Survey-inventory Progress Report. In Caribou. Management Report of Survey-Inventory Activities, M.V. Hicks (ed.). Federal Aid in Wildlife Restoration Grants W-24-1 and W-24-2. Alaska Dept. of Fish and Game, Juneau, Alaska.

________**. 1997.** Teshekpuk Lake Caribou Herd. Survey-inventory Progress Report. In Caribou. Management Report of Survey-Inventory Activities, M.V. Hicks (ed.). Federal Aid in Wildlife Restoration Grants W-24-3 and W-24-4. Alaska Dept. of Fish and Game, Juneau, Alaska.

________**. 1998a.** Brown bear survey-inventory management report, Unit 26A., M.V. Hicks, ed. Federal Aid in Wildlife Restoration-Inventory Management Report-Brown Bear, 1 July 1994-30 June 1996, Grants W-24-3 and W-24-4, Study 4.0. Juneau, AK: State of Alaska, Dept. of Fish and Game.

_______. **1998b.** Moose survey-inventory management report. pp. 457-471 in M.V. Hicks, ed. Report of survey-inventory activities, 1997-1999. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Progress Report. Grants W-24-4, W-24-5. Juneau, Alaska.

_______. **1999.** Teshekpuk Lake Caribou Herd. In Caribou. Management Report of Survey-Inventory Activities, M.V. Hicks (ed.). Federal Aid in Wildlife Restoration Grants W-24-5 and W-27-1. Alaska Dept. of Fish and Game, Juneau, Alaska.

_______. **2000a.** GMU 26A: Western North Slope. in Wolf. Management Report of Survey-Inventory Activities, M.V. Hicks (ed.). Federal Aid in Wildlife Restoration Grants W-24-5, W-27-1, and W-27-2. Alaska dept. of Fish and Game, Juneau, Alaska.

_______. **2000b.** Moose survey-inventory management report. pp. 523-537 in M.V. Hicks, ed. Report of survey-inventory activities, 1995-1997. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Progress Report. Grants W-27-1, W-27-2. Juneau, Alaska.

_______. **2001.** Teshekpuk Lake Caribou Herd Survey-Inventory Progress Report. In Caribou. Management Report of Survey-Inventory Activities, M.V. Hicks (ed.). Alaska Dept. of Fish and Game, Juneau, Alaska.

_______. **2003a.** Unit 26A caribou management report. Pages 280-303 in C.E. Healy, ed. Caribou management report of survey and inventory activities 1 July 2000-30 June 2002. Alaska Department of Fish and Game. Juneau, Alaska.

_______. **2003b.** Unit 26A wolf management report. pp. 247-259 in C. Healy, editor. Wolf management report of survey and inventory activities 1 July 1999-30 June 2002. Alaska Department of Fish and Game. Juneau, Alaska.

_______. **2004a.** Unit 26A furbearer management report. pp. 352-359 in C. Brown, editor. Furbearer management report of survey and inventory activities 1 July 2000-30 June 2003. Alaska Department of Fish and Game. Project 7.0. Juneau, Alaska.

_______. **2004b.** Unit 26A moose management report. pp. 597-612 in C. Brown, editor. Moose management report of survey and inventory activities 1 July 2001-30 June 2003. Alaska Department of Fish and Game. Project 1.0. Juneau, Alaska.

_______. **2005a.** Alaska Department of Fish and Game, Barrow area biologist. Unpublished data in Excel spreadsheet, transmitted to Dave Yokel, BLM, Arctic Field Office wildlife biologist and dated 09-22-2005.

_______. **2005b.** Unit 26A brown bear management report. pp. 310-325 in C. Brown, editor. Brown bear management report of survey and inventory activities 1 July 2002-30 June 2004. Alaska Department of Fish and Game. Juneau, Alaska.

_______. **2005c.** Unit 26A caribou management report. Pages 246-268 in C. Brown, editor. Caribou management report of survey and inventory activities 1 July 2002-30 June 2004. Alaska Department of Fish and Game. Juneau, Alaska.

_______. **2006a.** Alaska Department of Fish and Game, Barrow area biologist. Telephone conversation with Dave Yokel, BLM, Arctic Field Office wildlife biologist, 02-28-2006.

_______. **2006b.** Unit 26A wolf management report. pp. 253-264 in P. Harper, editor. Wolf management report of survey and inventory activities 1 July 2002-30 June 2005. Alaska Department of Fish and Game. Project 14.0. Juneau, Alaska.

_______. **2006c** (in press). Unit 26A furbearer. in P. Harper, editor. Furbearer management report of survey and inventory activities 1 July 2006-0 June 2009. Alaska Department of Fish and Game. Project 7.0. Juneau, Alaska, USA.

_______. **2007a.** Personal communication. December 12, 2007.

_______. **2007b.** Unit 26A brown bear management report. pp. 324-339 in P. Harper, editor. Brown bear management report of survey and inventory activities 1 July 2004 – 30 June 2006. Alaska Department of Fish and Game. Juneau, Alaska.

_______. **2007c.** Unit 26A furbearer. pp. 335-343 in P. Harper, editor. Furbearer management report of survey and inventory activities 1 July 2003-30 June 2006. Alaska Department of Fish and Game. Project 7.0. Juneau, Alaska.

_______. **2007d.** Unit 26A, Teshekpuk caribou herd. pp. 262-283 in P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2004-30 June 2006. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska.

_______. **2008a.** Personal communication. December 16, 2008.

_______. **2008b.** Unit 26A moose management report. pp. 648-667 in P. Harper, editor. Moose management report of survey and inventory activities 1 July 2005-30 June 2007. Alaska Department of Fish and Game. Project 1.0. Juneau, Alaska.

_______. **2009.** Unit 26A wolf management report. Pages 265-268 in P. Harper, editor. Wolf management report of survey and inventory activities 1 July 2005-30 June 2008. Alaska Department of Fish and Game. Juneau, Alaska.

_______. **2010.** Personal communication. August 24, 2010.

_______ **and Smithhisler, J.R. 1980.** Observations of bowhead whales during spring migration. Mar. Fish Rev. 42(9-10):80-85.

_______**, L.S. Parrett, J.C. George, and D.A. Yokel. 2005.** Calving distribution of the Teshekpuk caribou herd, 1994-2003. Rangifer Special Issue No. 16: 27-35.

Carruthers, D.R., R.D. Jakimchuk, and S.H. Ferguson. 1984. The relationship between the Central Arctic Caribou herd and the Trans-Alaska Pipeline. Alyeska Pipeline Company, Anchorage, Alaska.

_______ **and R.D. Jakimchuk. 1987.** Migratory movements of the Nelchina caribou herd in relation to the Trans-Alaska Pipeline. Wildlife Society Bulletin 15: 414-420.

Canadian Environmental Assessment Agency (CEAA). 2010. Report of the Federal Review Panel Established by the Minister of the Environment: Taseko Mines Limited's Prosperity Gold-Copper Mine Project. Ottawa, Ontario.

Cave B., P. Molyneux, and Coutts, A. 2004. Healthy Sustainable Communities: What Works? Milton Keynes and South Midlands Health and Social Care Group.

CAVM Team. 2003. Circumpolar Arctic Vegetation Map. Scale 1:7,500,000. Conservation of Arctic Flora and Fauna (CAFF) Map No. 1. U.S. Fish and Wildlife Service, Anchorage, Alaska.

Cecere, D. 2008. Bulletin: Gonorrhea – Alaska 2007. State of Alaska Department of Health and Social Services, Division of Public Health, Epidemiology, Anchorage, Alaska.

Center for Climate Strategies (CCS). 2009. Final Alaska Greenhouse Gas Inventory and Reference Case Projections, 1990 – 2025.

Centers for Disease Control and Prevention. 2010. Public Health Preparedness: Strengthening the Nation's Emergency Response State by State. September, 2010. Office of Public Health Preparedness and Response, Centers for Disease Control and Prevention. [http://emergency.cdc.gov/publications/2010phprep].

Centers for Disease Control. 2011. Helicobacter pylori. Downloaded January 25, 2011. [http://www.cdc.gov/ncidod/aip/research/hp.html]

Center for Environmental Management of Military Lands (CEMML). 2006. Integrated Cultural Resources Management Plan, Distant Early Warning System. Alaska. Center for Environmental Management of Military Lands, Colorado State University, Fort Collins Colorado.

Chambers, M.K., D.M. White, M.R. Lilly, [and others]. 2008. Exploratory Analysis of the Winter Chemistry of Five Lakes on the North Slope of Alaska. Journal of the American Water Resources Association 44(2):316-327.

Chan H.M., K. Fediuk, S. Hamilton, [and others]. 2006. Food security in Nunavut, Canada: barriers and recommendations. Int J Circumpolar Health 65(5): 416-431.

Chance, N.A. 1966. The Eskimo of North Alaska. Holt, Rinehart and Winston, Inc.

________. 1990. The Iñupiat and Arctic Alaska : An Ethnography of Development. Holt, Rinehart and Winston, Fort Worth, TX.

Chang-Kue, K.T.J. and E.F. Jessop. 1992. Coregonid Migration Studies at Kukjuktuk Creek, a Coastal Drainage on the Tuktoyaktuk Peninsula, Northwest Territories. Canadian Technical Report of Fisheries and Aquatic Sciences 1811, Department of Fisheries and Oceans, Central and Arctic Regions, Winnipeg, Manitoba.

Chapin, F.S., III, R.J. Barsdate, and D. Barél. 1978. Phosphorus Cycling in Alaskan Coastal Tundra: A Hypothesis for the Regulation of Nutrient Cycling. Oikos 31:189-199.

________, and M.C. Chapin. 1980. Revegetation of an Arctic Disturbed Site by Native Tundra Species. Journal of Applied Ecology. 17(2):449-456.

________, P.C. Miller, W.D. Billings, and P.J. Coyne. 1980. Carbon and Nutrient Budgets and Their Control in Coastal Tundra. Pages 458-484 In An Arctic Ecosystem: The Tundra at Barrow, Alaska, J. Brown, P. C. Miller, L. L. Tieszen, and F. L. Bunell (eds.). Dowden, Hutchinson, and Ross, Stroudsberg, Pennsylvania.

________ **and G.R. Shaver. 1981.** Changes in Soil Properties and Vegetation Following Disturbance of Alaskan Arctic Tundra. Journal of Applied Ecology 18(2)605-617.

________ **and G.R. Shaver. 1985.** Individualistic Growth Response of Tundra Plant Species to Environmental Manipulations in the Field. Ecology 66: 564-576.

________ **G.R. Shaver, A.E. Giblin, K.J. Nadelhoffer, and J.A. Laundre. 1995.** Responses of Arctic Tundra to Experimental and Observed Changes in Climate. Ecology 76:694-711.

Chapman, C.J. and A.D. Hawkins. 1969. The Importance of Sound in Fish Behaviour in Relation to Capture by Trawls. Food and Agriculture Organization of the United Nations (FAO) Fisheries Report 62 (3): 717-729.

Chesemore, D.L. 1967. Ecology of the Arctic fox in northern and western Alaska. M.S. Thesis. University of Alaska, Fairbanks, Alaska.

Chien-Lu, P., M.H. Clark, and D.K. Swanson. 2004, Cryosols Permafrost-Affected Soils, John M. Kimble, editor, 2004, Springer-Verlag Berlin Heidelberg New York, ISBN 3-540-20751-1, Chapter 2. Cryosols in Alaska

Child and Adolescent Health Measurement Initiative (CAHMI). 2007. National Survey of Children's Health. Data Resource Center on Child and Adolescent Health website [http://childhealthdata.org/learn/NSCH]

Chinn, L. 2007. Personal Communication, November 30, 2007.

Chiu, A.Y., P.E. Perez, and R.N. Parker. 1997. Impact of Banning Alcohol on Outpatient Visits in Barrow, Alaska. Journal of the American Medical Association 278(21): 1775-1777.

Christie, G.C. and H.A. Regier. 1988. Measures of Thermal Habitat and Their Relationship to Yields for four Commercial Fish Species. Canadian Journal of Fisheries and Aquatic Sciences 45:301-314.

Chuvilin, E.M., N.S. Naletova, E.C. Miklyaeva, E.V. Kozlova, and A. Instanes. 2001. Factors Affecting Spreadability and Transportation of Oil in Regions of Frozen Ground. Polar Records 37:229-338.

Circumpolar Active Layer Monitoring Network (CALM) 2005. CALM II (2004-2008): Long-Term Observations of the Climate-Active Layer-Permafrost System http://www.udel.edu/Geography/calm/data/data-links.html

Circumpolar Research Associates. 2002. Sociocultural Impacts of the Alpine Field on the Colville River Community of Nuiqsut: An Initial Assessment. Final Report. Prepared by CRA for Conoco Phillips, Inc. and the Kuukpikmiut Subsistence Oversight Panel, Anchorage, Alaska

________**. 2010.** 2010 North Slope Borough Census and Economic Profile, Health Section. Health data analyzed by Jana McAninch, Northern Health Impact Resource Group. Provided courtesy of the NSB Department of Health and Social Services, North Slope Borough, Alaska.

________. **2011.** Background and methods for the 2010 NSB Census. Personal Communication.

Clark C.W., W.T. Ellison, B.L. Southall, L. Hatch, S.M. Van Parijs, A. Frankel, and M. Ponirakis. 2009. Acoustic masking in marine ecosystems: intuitions, analysis, and implications: Marine Ecology Progress Series, v. 395, p. 301-322.

Clark, D.W. and A.M. Clark. 1993. *Batza Tena Trail to Obsidian: Archaeology at an Alaskan Obsidian Source* Archaeological Survey of Canada, Mercury Series Paper 147, Canadian Museum of Civilization, Hull, Quebec.

Clarke, J.T., M.C. Ferguson, C.L. Christman, S.L. Grassia, A.A. Brower, and L.J. Morse. 2011a. Chukchi Offshore Monitoring in Drilling Area (COMIDA) Distribution and Relative Abundance of Marine Mammals: Aerial Surveys. Final Report, OCS Study BOEMRE 2011-06. National Marine Mammal Laboratory, Alaska Fisheries Science Center, NMFS, NOAA, 7600 Sand Point Way NE, F/AKC3, Seattle, WA 98115-6349.

________**, C.L. Christman, S.L. Grassia, [and others]. 2011b.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 2009. Final Report, OCS Study BOEMRE 2010-040. National Marine Mammal Laboratory, Alaska Fisheries Science Center, NMFS, NOAA, 7600 Sand Point Way NE, F/AKC3, Seattle, WA 98115-6349.

________**, C.L. Christman., M.C. Ferguson and S.L. Grassia. 2011c.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 2006-2008. Final Report, OCS Study BOEM 2010-033. National Marine Mammal Laboratory, Alaska Fisheries Science Center, NMFS, NOAA, 7600 Sand Point Way NE, F/AKC3, Seattle, WA 98115-6349.

________**, Christman C.L., A.A. Brower, M.C. Ferguson. 2012.** Distribution and relative abundance of marine mammals in the Alaskan Chukchi and Beaufort seas, 2011. Annual Report, OCS Study BOEM 2012-009. National Marine Mammal Laboratory, Alaska Fisheries Science Center, NMFS, NOAA, 7600 Sand Point Way NE, F/AKC3, Seattle, WA 98115-6349.

Clean Air Status and Trends Network (CASTNet). 2010. Data available online at: http://www.epa.gov/castnet/

Clemens, W.A. and L.G. Nelms. 1993. Paleontological Implications of Alaskan Terrestrial Vertebrate Fauna in Latest Cretaceous Time at High Paleolatitudes. *Geology* 21:503-506.

Clough, J.G., A.C. Christensen, and P.C. Patton (eds.). 1987. Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment. U.S. Department of the Interior, Washington D.C.

Clow, G. and A. Lachenbruch. 1998. Borehole locations and permafrost depths, Alaska, USA. In: International Permafrost Association, Data and Information Working Group, comp. Circumpolar Active-Layer Permafrost System (CAPS), version 1.0. CD-ROM available from National Snow and Ice Data Center, nsidc@kryos.colorado.edu. Boulder, Colorado: NSIDC, University of Colorado at Boulder. http://nsidc.org/data/docs/fgdc/ggd223_boreholes_alaska/

Clum, N.J. and T.J. Cade. 1994. Gyrfalcon (*Falco rusticolus*). *In* The Birds of North America, No. 114 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Coady, J.W. 1980. History of moose in northern Alaska and adjacent regions. Canadian Field Naturalist 94:61-68.

Codarin, A., L.E. Wysocki, F. Ladich, and M. Picciulin. 2009. Effects of Ambient and Boat Noise on Hearing and Communication in Three Fish Species Living in a Marine Protected Area (Miramare, Italy). Marine Pollution Bulletin 58(12):1880-1887.

Cohen, D.M., T. Inada, T. Iwamoto, and N. Scialabba. 1990. FAO Species Catalogue: Vol. 10. Gadiform Fishes of the World (Order Gadiformes): An Annotated and Illustrated Catalogue of Cods, Hakes, Grenadiers and Other Gadiform Fishes Known to Date. FAO Fisheries Synopsis No. 125, Volume 10. Food and Agriculture Organization (FAO) of the United Nations, Rome.

Collier, T.K., C.A. Krone, M.M. Krahn, J.E. Stein, S-L Chan, and U. Varanasi. 1996. Petroleum Exposure and Associated Biochemical Effects in Subtidal Fish after the Exxon Valdez Oil Spill. Pages 671-683 *In* S.D Rice, R.B. Spies, D.A. Wolfe, and B.A. Wright, editors. 1996. Proceedings of the Exxon Valdez Oil Spill Symposium, February 2-5, 1993, Anchorage, AK. American Fisheries Society Symposium 18.

Collins, C.M., C.H. Racine, and M.E. Walsh. 1993. Fate and Effects of Crude Oil Spilled on Subarctic Permafrost Terrain in Interior Alaska: Fifteen Years Later. CRREL Report 93-13. U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.

Collins, F.R. 1958. Test Wells, Umiat Area; Exploration of the Naval Petroleum Reserve No. 4 and Adjacent Areas, Northern Alaska, 1944-53; Part 5, Subsurface Geology and Engineering Data. US Geological Survey Professional Paper 305-B.

Colonell, J.M. and B.J. Gallaway, editors. 1990. An Assessment of Marine Environmental Impacts of West Dock Causeway. Prepared by LGL Alaska Research Associates, Inc., and Environmental Science and Engineering, Inc., Anchorage, AK. Prepared for the Prudhoe Bay Unit Owners and ARCO Alaska, Inc.

________ **and B.J. Gallaway. 1997.** Wind-driven Transport and Dispersion of Age-0 Arctic Cisco along the Beaufort Sea Coast. American Fisheries Society Symposium 19: 90-103.

Comfort, G., T. Roots, L. Chabot, and F. Abbott. 1983. Oil Behavior Under Multi-year Ice at Griper Bay, NWT. Proceedings of the Sixth Arctic and Marine Oilspill Program Technical Seminar, Ottawa, 1983. Environment Canada, Ottawa, Canada.

Conn, J.S., C. Behr-Andres, J. Wiegers, E. Meggert, and N. Glover. 2001. Remediation of Arctic Tundra Following Petroleum or Salt Water Spills. Polar Record. 37(202):264-266.

Connors, P.G., J.P. Myers, and F.A. Pitelka. 1979. Seasonal habitat use by Arctic Alaskan Shorebirds. Studies in Avian Biology 2:101-111

_______, **J.P. Myers, C.S.W. Connors, and F.A. Pitelka. 1981.** Interhabitat movements by sanderlings in relation to foraging profitability and the tidal cycle. Auk 98: 49-64

ConocoPhillips Alaska, Inc. 2008. Air Quality and Meteorology Data from April 1, 2007 – March 31, 2008 at Nuiqsut, Alaska, pp. ES-1 to ES-2. Data obtained from ConocoPhillips Alaska, Inc., Anchorage, AK.

_______**. 2011.** Air Quality and Meteorology Data for 2010 at Nuiqsut, Alaska. Data obtained from ConocoPhillips Alaska, Inc, Anchorage, Alaska.

Coonrad, W.L., ed. 1982. The United States Geological Survey in Alaska; accomplishments during 1980: U.S. Geological Survey Circular 844, 178 p.

Cook, J.A. and S.O. MacDonald. 2004. Mammal inventory of Alaska's National Parks and Preserves, Arctic Network: Bering Land Bridge NP, Cape Krusenstern NM, Kobuk Valley NP, Noatak NP, Gates of the Arctic NP&P. National Park Service Alaska Region, Inventory and Monitoring Program Final Report.

Cook, J.P. 1995. Alaska's Obsidian Network. Paper presented at the 22nd Annual Meeting of the Alaska Anthropological Association, Anchorage, Alaska.

Cornelissen, J.H.C., T.C. Callaghan, J.M. Alatalo, [and others]. 2001. Global change and arctic ecosystems: is lichen decline a function of increases in vascular plant biomass? J. Ecology. 89:984-994.

Cornelius, C.E. and Kaneko JJ. 1963. Clinical biochemistry of domestic animals. Academic Press, New York. 678pp.

Cortés-Burns, H., M.L. Carlson, R. Lipkin, L. Flagstad, and D. Yokel. 2009. Rare vascular plants of the North Slope: a review of the taxonomy, distribution and ecology of 31 rare plant taxa that occur in Alaska's North Slope region. BLM Alaska Technical Report 58. Bureau of Land Management, Fairbanks, AK. BLM/AK/GI-10/002+6518+F030.

Cosens S.E. and L.P. Dueck. 1993. Icebreaker Noise in Lancaster Sound, N.W.T., Canada: Implications for marine mammal behavior. Marine Mammal Science 9(3): 285-300, July 1993.

COSEWIC. 2007. COSEWIC assessment and update status report on the Ross's Gull *Rhodostethia rosea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 24 pp.

Cott, P.A., B.W. Hanna, and J.A. Dahl. 2003. Discussion on Seismic Exploration in the Northwest Territories, 2000-2003. Canadian Manuscript Report of Fisheries and Aquatic Sciences 2648, Fisheries and Oceans Canada, Central and Arctic Region.

_______, **P.K. Sibley, A.M. Gordon, R.A. Bodaly, K.H. Mills, W.M. Somers, and G.A. Fillatre. 2008a.** The Effects of Water Withdrawal from Ice-Covered Lakes on Oxygen, Temperature, and Fish. Journal of the American Water Resources Association 44(2):328-342.

________, P.K. Sibley, W.M. Somers, M.R. Lilly, and A.M. Gordon. 2008b. A Review of Water Level Fluctuations on Aquatic Biota with an Emphasis on Fishes in Ice-Covered Lakes. Journal of the American Water Resources Association 44(2):343-359.

Cotter, P.A. and B.A. Andres. 2000. Nest Density of Shorebirds Inland from the Beaufort Sea Coast, Alaska. Canadian Field-Naturalist 114(2): 287-291.

Council on Environmental Quality (CEQ). 1997. Considering Cumulative Effects Under the National Environmental Policy Act. Council of Environmental Quality, Executive Office of the President, Washington, D.C.

________. 2010. Report Regarding the Minerals Management Service's National Environmental Policy Act Policies, Practices, and Procedures, as the Relate to Outer Continental Shelf Oil and Gas Exploration and Development. Available at http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100816-ceq-mms-ocs-nepa.pdf

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31, Washington, D.C., USFWS, DOI, 131 pp.

Cox, C., L.A. Schultz, R.P. Johnson, and R.A. Shelsby. 1980. The Transport and Behavior of Oil Spilled in and under Sea Ice. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado.

Cox, D.P. and D.A. Singer. 1987, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Cox, T., S. Leka, I. Ivanov, and E. Kortum. 2004. Work, employment and mental health in Europe. Work & Stress 18(2): 179-185.

Craig, J.D., K.W. Sherwood, and P.P. Johnson. 1985. Geologic Report for the Beaufort Sea Planning Area, Alaska: Regional Geology, Petroleum Geology, Environmental Geology. Outer Continental Shelf Report MMS 85-0111. U.S. Department of Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

Craig, J.E. and K.W. Sherwood. 2001. Excel Economic Model from Summary of Economic Study of the Burger Gas Discovery, Chukchi Shelf, Northwest Alaska. July 2001; Revisions December 2004. U.S. Department of the Interior, Minerals Management Service; Alaska Region. http://www.alaska.boemre.gov/re/BurgerResources/Burger%20Fact%20Sheet.pdf

Craig, P.C. 1984a. Fish Use of Coastal Waters of the Alaskan Beaufort Sea: A Review. Transactions of the American Fisheries Society 113:265-282.

________. 1984b. Fish Resources. Pages 117-131. In: Proceedings of a Synthesis Meeting: The Barrow Arch Environment and Possible Consequences of Planned Offshore Oil and Gas Development, J.C. Truett, ed. Girdwood, Alaska, October 31 - November 1, 1983. MMS/NOAA, Anchorage, Alaska.

_______. **1985.** Fish Resources at Point Lay, Alaska. Report by LGL Alaska Research Associates, Inc., Anchorage for North Slope Borough, Barrow.

_______. **1987.** Subsistence Fisheries at Coastal Villages in the Alaskan Arctic, 1970-1986. Alaska Outer Continental Shelf Socioeconomic Studies Program, Technical Report Number 129. Minerals Management Service, Anchorage, Alaska

_______. **1989a**. An Introduction to Anadromous Fishes in the Alaskan Arctic. Biological Papers of the University of Alaska 24:27-54.

_______. **1989b.** Subsistence Fisheries at Coastal Villages in the Alaskan Arctic, 1970-1986. Biological Papers of the University of Alaska 24:131-152.

_______ **and P. McCart. 1974.** Fish Use of Nearshore Coastal Waters in the Western Arctic: Emphasis on Anadromous Species. In Assessment of the Arctic Marine Environment: Selected Topics. Institute of Marine Science, University of Alaska, Fairbanks, Alaska.

_______ **and L. Haldorson. 1981.** Beaufort Sea Barrier Island-Lagoon Ecological Process Studies: Final Report, Simpson Lagoon. Part 4 In Environmental Assessment of the Alaskan Continental Shelf. Final Report, Volume 7. Bureau of Land Management and National Oceanic and Atmospheric Administration, Outer Continental Shelf Environmental Assessment Program.

_______**, W.B. Griffiths, L. Haldorson, and H. McElderry. 1982.** Ecological Studies of Arctic Cod (*Boreogadus saida*) in Beaufort Sea Coastal Waters, Alaska. Canadian Journal of Fisheries and Aquatic Sciences 39:395-406.

_______ **and D. Schmidt. 1982.** Fisheries Surveys at Potential Dredging Sites at North Slope Villages: Wainwright, Point Lay, Atqasuk, Nuiqsut, and Kaktovik. Report by LGL Alaska Research Associates, Inc. for North Slope Borough, Barrow, Alaska.

_______ **and P. Skvorc. 1982.** Fish Resources of the Chukchi Sea: Status of Existing Information and Field Program Design. Pages 1-62. In: Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Volume 63, August 1989. U.S. Department of Commerce and U.S. Department of the Interior, Anchorage, Alaska.

_______ **and L. Haldorson. 1986.** Pacific Salmon in the North American Arctic. Arctic 39:2-7.

Crass, B. and C. Holmes. 2004. Swan Point: A Case for Land Bridge Migration in the Peopling of North America. Paper presented at the 68th Annual Meeting of the Society for American Archaeology, Montreal, Canada.

Criminal Justice Council, Alaska Judicial Council (CJC). 2002. Interim Status Report of the Alaska Criminal Justice Council. Anchorage, Alaska: [http://www.ajc.state.ak.us/reports/InterimCJCReport.pdf]

Critchlow, K.R. 1983. Fish Study. In Prudhoe Bay Waterflood Environmental Monitoring Program 1982. Report Prepared by Woodward-Clyde Consultants for U.S. Army Corps of Engineers, Alaska District, Anchorage, Alaska.

CRS Report for Congress RL31022. 2006, Arctic Petroleum Technology Development, Bernard A. Gelb, M. Lynne Corn and Terry R. Twyman. Updated January 23, 2006.

Cronin, M.A., W.B. Ballard, J. Truett, and R. Pollard. 1994. Mitigation of the Effects of Oil Field Development and Transportation Corridors on Caribou. LGL, Inc., Anchorage, Alaska.

_______, **B.J. Pierson, S.R. Johnson, L.E. Noel, and W.B. Ballard. 1997.** Caribou Population Density in the Prudhoe Bay Region of Alaska. Journal of Wildlife Resources 2:59-68.

_______, **S.C. Amstrup, G.M. Durner, L.E. Noel, and W.B. Ballard. 1998.** Caribou distribution during the post-calving period in relation to infrastructure in the Prudhoe Bay Oil Field. Arctic 51:85-93

_______, **H.A. Whitlaw, and W.B. Ballard. 2000.** Northern Alaska Oil Fields and Caribou. Wildlife Society Bulletin 28(4):919-922

_______, **J.C. Patton, N. Balmysheva, and M.D. MacNeil. 2003.** Genetic variation in caribou and reindeer (Rangifer tarandus). Animal Genetics 34(1):33-41.

Cruxent, J.M. 1956. A Lithic Industry if Paleo-Indian Type in Venezuela. *American Antiquity* 22(2):172-179.

Cunjak, R.A.,T.D. Prowse, and D.L. Parrish. 1998. Atlantic salmon (*Salmo salar*) in winter: the season of parr discontent? Canadian Journal of Fisheries and Aquatic Sciences, 55(S1):161–180.

Curatolo, J.A. 1984. A Study of Caribou Response to Pipelines in and Near the Eileen West End, 1983. Sohio Alaska Petroleum Co., Anchorage, Alaska.

_______ **and S.M. Murphy. 1986.** The Effects of Pipelines, Roads, and Traffic on the Movements of Caribou, Rangifer tarandus. Canadian Field-Naturalist 100(2):218-224.

Curtis, T., S. Kvernmo, P. Bjerregaard. 2005. Changing Living Conditions, Lifestyle and Health. Int J Circumpolar Health 64(5): 442-450.

Daling, P.S., and T. Strom. 1999. Weathering of Oil at Sea: Model/Field Data Comparisons. Spill Science and Technology 51:63-74.

Dames and Moore. 1983. Environmental Baseline Studies, Red Dog Project. Water Quality Report, Chapter 3, prepared by L.A. Peterson and Associates, Inc., for the Red Dog Mine Project, Cominco, Alaska, Inc., Anchorage, Alaska.

_______. **1985.** Prudhoe Bay Unit Waterflood Marine Life Return Monitoring Program: June 11, 1984 through June 15, 1985. Annual Report to ARCO Alaska, Inc., and the Prudhoe Bay Unit Owners.

_______. **1986.** Prudhoe Bay Unit Waterflood Marine Life Return Monitoring Program: June 11, 1984 through September 22, 1985. Final Report to ARCO Alaska, Inc., and the Prudhoe Bay Unit Owners.

_______. **1987.** Kuparuk River Unit Waterflood Project Marine Life Bypass System Monitoring Program: January through December, 1986. Annual Report to ARCO Alaska, Inc., and the Kuparuk River Unit Owners.

_______. **1988.** Kuparuk River Unit Waterflood Project Marine Life Bypass System Monitoring Program. 1987 Annual Report to ARCO Alaska, Inc., and the Kuparuk River Unit Owners.

Danks, F.S. 2000. Potential muskox habitat in the National Petroleum Reserve – Alaska: a GIS analysis. M.S. Thesis, University of Alaska, Fairbanks, AK. xiv + 133 pp.

Dau, C.P. and K.S. Bollinger. 2009. Aerial population survey of common eiders and other waterbirds in near shore waters and along barrier islands of the Arctic Coastal Plain of Alaska, 1-5 July 2009. U.S. Fish and Wildlife Service, Waterfowl Management, Anchorage, AK. 20pp.

Dau, J. 1986. Distribution and behavior of barren-ground caribou in relation to weather and parasitic insects. M.S. Thesis. University of Alaska, Fairbanks, Alaska.

_______. **1999.** Caribou survey-inventory management report. Units 21D, 22A, 22B, 23, 24, 26A. Pp 160-185 in M.V. Hicks, ed. Caribou. Alaska Department of Fish and Game. Federal aid in wildlife restoration survey-inventory activities 1 July 1994-30 June 1996. Grants W-24-5 and W-27-1. Juneau, Alaska.

_______. **2001.** Units 21D, 22A, 22B, 23, 24, 26A in Caribou survey-inventory management report, July 1 1998-June 30 2000. C. Healy, editor. Pages. 181-218. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration, Grants W-27-2 and W-27-3. Project 3.0. Juneau, Alaska.

_______. **2001.** Muskox Survey-Inventory Management Report, Unit 23. In Muskox. Federal Aid in Wildlife Restoration - Inventory Management Report, Grants W-24-5 and W27-1, Study 16.0, M.V. Hicks (ed.). Alaska Department of Fish and Game, Juneau, Alaska.

_______. **2002.** Units 23 and 26A. Dall sheep management report. pp. 142-154 in C. Healy, editor. Dall sheep management report of survey and inventory activities 1 July 1998-30 June 2001. Alaska Department of Fish and Game. Project 6.0. Juneau, Alaska.

_______. **2003a**. Unit 23 muskox management report. pp. 43-53 in C. Healy, editor. Muskox management report of survey and inventory activities 1 July 2000-30 June 2002. Alaska Department of Fish and Game. Juneau, Alaska.

_______. **2003b.** Western Arctic caribou herd management report. Pages 204-251 in C. Healy, editor. Caribou management report of survey and inventory activities 1 July 2000-30 June 2002. Alaska Department of Fish and Game. Juneau, Alaska.

_______. **2005a.** Unit 23 and Subunit 26A Dall sheep management report. pp. 148-159 in C. Brown, editor. Dall sheep management report of survey and inventory activities 1 July 2001-30 June 2004. Alaska Department of Fish and Game. Project 6.0. Juneau, Alaska.

_______. **2005b.** Units 21D, 22A, 22B, 22C, 22D, 22E, 23, 24 and 26A caribou herd management report. pp. 177-218 in: C. Brown, editor. Caribou management report of survey-inventory activities 1 July 2002-30 June 2004. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska.

_______. **2006a.** Alaska Department of Fish and Game, Kotzebue area biologist. E-mail to, and phone conversation, with Dave Yokel, BLM, Arctic Field Office wildlife biologist. 01-06-2006 and 02-09-2006, respectively.

_______. **2006b.** Alaska Department of Fish and Game, Kotzebue area biologist. Telephone conversation with Dave Yokel, BLM, Arctic Field Office wildlife biologist. 03-01-2006.

_______. **2007a.** Unit 23 muskox. pp. 35-48 in P. Harper, editor. Muskox management report of survey and inventory activities 1 July 2004-30 June 2006. Alaska Department of Fish and Game. Project 16.0. Juneau, Alaska, USA.

_______. **2007b.** Units 21D, 22A, 22B, 22C, 22D, 22E, 23, 24 and 26A caribou management report. pp. 174-231 in: P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2004-30 June 2006. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska.

_______. **2008.** Alaska Department of Fish and Game, Kotzebue area biologist. Remarks made at Western Arctic Herd Caribou Working Group meeting, 12/10/2008.

_______. **2010.** Alaska Department of Fish and Game, Kotzebue area biologist. Remarks made at Western Arctic Herd Caribou Working Group meeting, 12/14/2010.

Davies, J.R. 1997. The Impact of an Offshore Drilling Platform on the Fall Migration Path of Bowhead Whales: A GIS-Based Assessment. M.S. Thesis. Western Washington University, Pullman, Washington.

Davis, C.W., D.C. Linck, K.M. Schoenberg, and H.M. Shields. 1981. Slogging, Humping, and Mucking through the NPR-A: An Archaeological Interlude. Occasional Paper No. 25. Cooperative Park Studies Unit, Fairbanks, Alaska.

Davis, J.L. and P. Valkenburg. 1978. Western Arctic Caribou Herd Studies. Federal Aid in Wildlife Restoration Grants W-17-8 and W-17-9. Alaska Dept. of Fish and Game, Juneau, Alaska.

_______. **1979.** Caribou distribution, population characteristics, mortality, and response to disturbance in northwest Alaska. In Studies of Selected Wildlife and Fish and their Habitat on and Adjacent to National Petroleum Reserve in Alaska (NPR-A), 1977-1978, P.C. Lent (ed.). Volume 1, Work Group 3, Field Study 3. U.S. Dept. of the Interior, Anchorage, Alaska.

_______**, P. Valkenburg, and H.V. Reynolds. 1980.** Population Dynamics of Alaska's Western Arctic Caribou Herd. In Proceedings of the Second International Reindeer/Caribou Symposium, September 17-21, 1979, Røros, Norway, E. Reimers, E. Gaare, and S. Skennsberg (eds.). Direktorat for Vilt og Ferskvannsfisk, Trondheim, Norway.

________. 1982. Home range use, social structure and habitat selection of the Western Arctic Caribou Herd. Fairbanks, AK: USDOI, National Park Service.

________. 1986. Empirical and theoretical considerations toward a model for caribou socioecology. Rangifer, Special Issue No. 1:103-109.

Davis, R. A. and D.H. Thomson. 1999. Review of Potential Effects of Seismic Exploration on Georges Bank. Report Prepared By LGL Limited Environmental Research Associates, King City, Ontario, for Georges Bank Review Panel, Halifax, Nova Scotia. LGL Report No. TA 2308-1.

Dawe, R. 2003. NPR-A Field Notes, Kuna River Survey.

Day, G., E.M. Provost, and A.P. Lanier. 2006. Alaska Native Mortality Update: 1999-2003. Alaska Native Epidemiology Center, Office of Alaska Native Health Research, Division of Community Health Services, Alaska Native Tribal Health Consortium, Anchorage, Alaska.

Day R.H. 1995. New information on Kittlitz's murrelet nests. Condor 97:271-273.

________, K.L. Oakley, and R. Barnard. 1983. Nest sites and eggs of Kittlitz's and marbled murrelets. Condor 85(3):265-273.

________ and A. A. Stickney. 1996. Kittlitz's Murrelet surveys at remote Air Force sites in Alaska, 1995. Unpublished report prepared for the U.S. Air Force, Eielson Air Force Base, AK, by ABR, Inc., Fairbanks, AK. 46 pp.

________. 1998. Predator Populations and Predation Intensity on Tundra-Nesting Birds in Relation to Human Development. Unpublished Report Prepared for Northern Alaska Ecological Services, U.S. Fish and Wildlife Service, Fairbanks, AK. 81 pp.

________ and D.A. Nigro. 1999. Status and Ecology of Kittlitz's Murrelet in Prince William Sound, 1996-1998. Exxon Valdez Oil Spill Restoration Project Final Report (Restoration Project 28 98142). ABR, Inc., Fairbanks, Alaska.

________, K.J. Kuletz, and D.A. Nigro. 1999. Kittlitz's murrelet (*Brachyramphus brevirostris*). In: Poole A, Gill F, editors. The Birds of North America. Academy of Natural Sciences, Philadelphia, PA, and American Ornithologists' Union, Washington, DC.

________, I.J. Stenhouse, and H.G. Gilchrist. 2001. Sabine's Gull (*Xema sabini*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/593doi:10.2173/bna.593

________, A.K. Prichard, J.R. Rose, and A.A. Stickney. 2003. Migration and Collision Avoidance of Eiders and Other Birds at Northstar Island, Alaska, 2001 and 2002. Prepared by ABR, Inc., Fairbanks, Alaska, for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

________, A.K. Prichard, and J.R. Rose. 2005. Migration and collision avoidance of eiders and other birds at Northstar Island, Alaska, 2001-2004: Final Report. Prepared for BP Exploration (Alaska) Inc.; prepared by ABR, Inc. - Environmental Research & Services, Fairbanks, AK. 154pp.

________, A.E. Gall, A.K. Prichard. 2010. The status and distribution of Kittlitz's Murrelet (*Brachyramphus brevirostris*) in northern Alaska. Unpublished Report for the USFWS by ABR, Inc. Fairbanks, AK.

Deegan, L.A. and B.J. Peterson. 1992. Whole-river Fertilization Stimulates Fish Production in an Arctic Tundra River. Canadian Journal of Fisheries and Aquatic Sciences 49:1890-1901.

DeGeorge, Lynn. 2012. Personal Communication. E-mail to Jim Ducker. July, 24, 2012.

Dehn, L.A., G.G. Sheffield, E.H. Follmann, L.K. Duffy, D.L. Thomas, and T.M. O'Hara. 2007. Feeding ecology of phocid seals and some walrus in the Alaskan and Canadian Arctic as determined by stomach contents and stable isotope analysis. Polar Biology 30: 167-181.

Delaney, R. 2007. Personal communication. February 27, 2007.

Delarue, J., M. Laurinolli, and B. Martin. 2009. Bowhead whale (*Balaena mysticetus*) songs in the Chukchi Sea between October 2007 and May 2008. J. Acoust. Soc. Am., Vol. 126, No. 6, December 2009.

DeMarban, A. 2011. North Slope tribal councils wants Umiat Road out of budget, Arctic Sounder Alaska Newspapers, Inc. , Accessed online on 11/21/2011 at http://www.thearcticsounder.com/article/1116north_slope_tribal_councils_wants_umiat_road.

DeMaster, D., W. Perryman, and L. Lowry. 1998. Beluga whale surveys in the eastern Chukchi Sea, July 1998. Alaska Beluga Whale Committee Report 98-2 submitted to the National Marine Fisheries Service, Juneau, AK. 16 p. (Available from the North Slope Borough, Department of Wildlife Management, Box 69, Barrow, AK 99723)

DeMaster, D.P. and I. Stirling. 1981. *Ursus maritimus.* Polar Bear. Mammalian Species 145:1–7.

Derksen, D.V., M.W. Weller, and W.D. Eldridge. 1979. Distributional Ecology of Geese Molting Near Teshekpuk Lake, National Petroleum Reserve – Alaska. In: Management and Biology of Pacific Flyway Geese – A Symposium. Jarvis, R.L. and Bartonek, J.C. (eds.) pp. 189 – 207.

________ and W.D. Eldridge. 1980. Drought-displacement of pintails to the Arctic coastal plain, Alaska. J. Wildl. Manage. 44:224-229.

________, T.C. Rothe, and W.D. Eldridge. 1981. Use of Wetland Habitats by Birds in the National Petroleum Reserve-Alaska. USDOI, FWS Resource Publication 141. 27 pp.

________, Eldridge, W.D. and M.W. Weller. 1982. Habitat ecology of Pacific black brant and other geese molting near Teshekpuk Lake, Alaska. Wildfowl 33: 39-57.

_______, K.S. Bollinger, D. Esler, K.C. Jensen, E.J. Taylor, M.W. Miller, and M.W. Weller. 1992. Effects of Aircraft on Behavior and Ecology of Molting Black Brant near Teshekpuk Lake, Alaska. Final Report. U. Department of Interior, U.S. Fish and Wildlife Service, Anchorage, Alaska.

Derocher A.E. and I. Stirling. 1991. Oil Contamination of Polar Bears. Polar Record 27(160):56-57.

_______, N.J. Lunn, and I. Stirling. 2004. Polar bears in a warming climate. Integrative and Comparative Biology 44:163-176.

DeVaughn, M. 2006. The Unofficial Guide to Adventure Travel in Alaska. John Wiley & Sons, Inc. Hoboken, NJ 07030.

DeVera, J., and K.R. McClay. 2004. Structure of the Red Dog District, Western Brooks Range, Alaska, Economic Geology, Vol. 99, pp. 1415-1434.

Devon Canada Corporation. 2004. Comprehensive Study Report Devon Beaufort Sea Exploration Drilling Program. Calgary, Alberta: Devon Canada Corporation.

Dewailly E., C. Blanched, S. Lemieux, [and others]. 2001. N-3 Fatty acids and cardiovascular disease risk factors among the Inuit of Nunavik. The American Journal of Clinical Nutrition 74: 464-473

_______, C. Blanchet, S. Gingras, S. Lemieux, and B.J. 2002. Cardiovascular disease risk factors and n-3 fatty acid status in the adult population of James Bay Cree. The American Journal of Clinical Nutrition 76: 85-92.

Dick, M.H. and W. Donaldson. 1978. Fishing vessel endangered by Crested Auklet landings. Condor 80:235–236.

Dickins, D.F. and I.A. Buist. 1981. Oil and Gas Under Sea Ice. Prepared for Canadian Offshore Oil Spill Research Association by Dome Petroleum Limited, Calgary, Canada.

_______, K. Vaudry, and S. Potter. 2000. Oil Spills in Ice Discussion Paper. Prepared by DF Dickins Associates Ltd., Vaudry & Associates Inc., SL Ross Environmental Research Limited for Alaska Clean Seas.

Dickman, M. and G. Rygiel. 1998. Municipal Landfill Impacts on a Natural Stream Located in an Urban Wetland in Regional Niagra, Ontario. Canadian Field Naturalist 112:619-630.

Diedrich, J. and C. Thomas. 1999. The Wild and Scenic River Study Process. Washington, DC: National Park Service, Interagency Wild and Scenic Rivers Coordinating Council, 50 pp.

Dietz, R., M.P. Heide-Joergensen, P.R. Richard, and M. Acquarone. 2001. Summer and fall movements of Narwhals (*Monodon monoceros*) from northeastern Baffin Island towards northern Davis Strait. Arctic 54:244-261.

DiGirolamo, A.M., G.S. Perry, B.D. Gold, [and other]. 2007. Helicobacter pylori, anemia, and iron deficiency: relationships explored among Alaska native children. Pediatric Infectious Disease Journal 26(10):927-34.

Dillehay, T.D. 1997. *Monte Verde: a late Pleistocene settlement in Chile, Vol. 2, the archaeological context and interpretation.* Smithsonian Institution Press, Washington, D.C.

Divoky, G.J., G.E. Watson, and J.C. Bartonek. 1974. The breeding of the Black Guillemot in northern Alaska. Condor 72:339-343.

________**, G.A. Sanger, S.A. Hatch, and J.C. Haney. 1988.** Fall migration of Ross's Gull (*Rhodostethia rosea*) in Alaska Chukchi and Beaufort Seas. Alaskan Fish and wildlife Research Center. OCS Study MMS 88-0023. Available online: http://www.mms.gov/alaska/reports/1980rpts/88_0023.pdf

D'Oro, R. 2010. "Eroding Alaska village appeals lawsuit's dismissal" January 29, 2010. JuneauEmpire.com http://juneauempire.com/stories/012910/sta_556400655.shtml

Dokuchaev, N.E. 1997. A new species of shrew (Soricidae, Insectivora) from Alaska. J. Mammalogy 78:811-817

Donaldson, G.M., C. Hyslop, R.I.G. Morrison, H.L. Dickson, and I. Davidson. 2001. Canadian Shorebird Conservation Plan. Canadian Wildlife Service Special Publications. Canadian Wildlife Service, Ottawa, Canada.

Douglas, D.C., P.E. Reynolds, and E.B. Rhode (eds.). 2002. Arctic Refuge coastal plain terrestrial wildlife research summaries. U.S. Geological Survey, Biological Resources Division, Biological Science Report USGS/BRD/BSR-2002-0001. U.S. Geological Survey, Biological Resources Division, Reston, Virginia. http://www.absc.usgs.gov/1002/

Dover, J.H. 1997a. Alaska Resource Data File - Howard Pass quadrangle: U.S. Geological Survey Open-File Report 97-296, 49 p.

________**. 1997b.** Alaska Resource Data File; Misheguk Mountain Quadrangle: U.S. Geological Survey Open-File Report 97-297, 18 p.

________**, I.L. Tailleur, and J.A. Dumoulin. 2004.** Geologic and Fossil Locality Maps of the West-Central Part of the Howard Pass Quadrangle and Part of the Adjacent Misheguk Mountain Quadrangle, Western Brooks Range, Alaska, U.S. Geological Survey Miscellaneous Field Studies Map MF–2413, 76 p. and 2 maps.

Doyle C, P. Kavanagh, O. Metcalfe, and T. Lavin. 2005. Health Impacts of Employment: A Review. The Institute of Public Health Ireland.

Driscoll, D.L. 2007. Social and Physical Determinants of Alaskan health: a meta-analysis. Presentation 27th Annual Alaska Health Summit, Anchorage, Alaska. Institute for Circumpolar Health Studies. University of Alaska Anchorage.

Druckenmiller, P.S. 2010. Annual and Final Report for 2010 for work conducted BLM Paleontological Use Permits: AA-92449 and AA-091193. University of Alaska Museum.

Dubé, J. 2006. NPR-A Field Notes, Utukok River Survey.

Dumond, D.E. 1987. The Eskimos and Aleuts. Thames and Hudson Ltd., London.

Duncan, E. 2011. Personal communication to Louis Niglio, September 10, 2011.

Durner, G.M., S.C. Amstrup, A.S. Fischbach. 2003. Habitat Characteristics of Polar Bear Terrestrial Maternal Den Sites in Northern Alaska. Arctic 56 (1):55-62.

_______, D.C. Douglas, R.M. Nielson, [and others]. 2009. Predicting 21st century polar bear habitat distribution from global climate models. Ecological Monographs 79(1): 25-58.

_______, A.S. Fischbach, S.C. Amstrup, and D.C. Douglas. 2010. Catalogue of polar bear (*Ursus maritimus*) maternal den locations in the Beaufort Sea and neighboring regions, Alaska, 1910-2010: U.S. Geological Series 568, 14 p.

Duval, W.S. 1993. Proceedings of a workshop on Beaufort Sea beluga: February 3-6, 1992. Vancouver, B.C. Env. Studies Res. Found. Rep. No 123. Calgary. 33 pp. + appendices.

Earnst, S.L. 2004. Status assessment and conservation plan for the Yellow-billed Loon (*Gavia adamsii*). U.S. Geological Survey, Scientific Investigations Report 2004-5258. 42 pp.

_______, R.A. Stehn, R.M. Platte, W.W. Larned, and E.J. Mallek. 2005. Population Size and Trend of Yellow-billed Loons in Northern Alaska. Condor 107:289-304.

_______, R.M. Platte, and L. Bond. 2006. A landscape-scale model of yellow-billed loon habitat preferences in northern Alaska. Hydrobiologia 567:227-236.

Eastland, W.G., R.T. Bowyer, and S.G. Fancy. 1989. Effects of snow cover on selection of calving sites by caribou. Journal of Mammalogy 70:824-828.

Ebbesson, S.E.O., C.D. Schraer, P.M. Risica, [and others]. 1998. Diabetes and impaired glucose tolerance in three Alaskan Eskimo populations. Diabetes Care 21: 563-569.

_______, L. Ebbesson, O. Go, J. Kennish, and J. Yeh. 1999. Diabetes is related to fatty acid imbalance in Eskimos. Int J Circumpolar Health 58 (2):108-119.

_______, T.K. Young, P. Bjerregaard, E. Dewailly, E. Dewailly, P.M. Risica, and M.E. Jørgensen. 2007. Prevalence of Obesity and Its Metabolic Correlates Among the Circumpolar Inuit in 3 Countries. American Journal Of Public Health 97(4): 691-695.

Ebbley, N.J. and H.R. Joesting. 1943. Report of Investigation of Petroleum Seepages, Arctic Slope Area, Alaska. U.S. Bureau of Mines and the Alaska Territorial Department of Mines Washington, D.C. and Juneau, Alaska. [Edition published on Alaska DGGS website as MR 195-27.pdf with additional material].

Eberhardt, L.E., W.C. Hanson, J.L. Bengston, R.A. Garrot, and E.E. Hanson.1982. Arctic Fox Home Range Characteristics in an Oil-Developed Area. Journal of Wildlife Management 46:183-190.

________, R.A. Garrott, and W.C. Hanson. 1983a. Winter Movements of Arctic Foxes, *Alopex lagopus*, in a Petroleum Development Area. Canadian Field-Naturalist 97(1):66-70.

________, R.A. Garrott, and W.C. Hanson. 1983b. Den Use by Arctic Foxes in Northern Alaska. Journal of Mammalogy 64: 97-102.

Eberl, C. and J. Picman. 1993. Effect of nest-site location on reproductive success of red-throated loons (*Gavia stellata*). Auk 110:436-444.

Ebisch. 1992. Kennecott Exploration, National Petroleum Reserve-Alaska, 1992 Pb-Zn-Ag program, in conjunction with the Arctic Slope Regional Corporation, 128 p., plus plates, figures, and plots.

Edsall, T.A. and J. Cleland. 2000. Optimum Temperature for Growth and Preferred Temperatures of Age-0 Lake Trout. North American Journal of Fisheries Management 20:804-809.

Edwards, W.C. 1985. Toxicology Problems Related to Energy Production. Veterinary and Human Toxicology 21:328-337.

Edwardson, C. 1976. Public Testimony. Federal Energy Hearings. Barrow, Alaska.

Eide, S.H., S.D. Miller, and M.A. Chihuly. 1986. Oil Pipeline Crossing Sites Utilized in Winter by Moose, *Alces alces*, and Caribou, *Rangifer tarandus*, in Southcentral Alaska. Canadian Field-Naturalist 100(2):197-207.

Ekak, C. 2010. Stacey Fritz interviewed Wainwright elder Charles (Chuck) Ekak by telephone in November, 2012.

Ellersieck, I. and I.L. Tailleur. 1986. The strategic and critical mineral resources of the southern part of the National Petroleum Reserve in Alaska: U.S. Geological Survey, Open-File Report 86-158

Elliott, G.V. 1982. Evaluation of Stream Crossings and Effects of Channel Modifications on Fishery Resources along the Route of the Trans-Alaska Pipeline, Final Report. U.S. Department of Interior, U.S. Fish and Wildlife Service, Anchorage, Alaska.

Elson, W. 2011. Personal Communication. E-Mail to David R. Maxwell (BLM) on Ultra-Low Sulfur Requirement for BLM EIS on North Slope, December 14, 2011. Environmental Protection Agency, Region X, Seattle, WA

Ely, C. R. and A.X. Dzubin. 1994. Greater White-fronted Goose (*Anser albifrons*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/131 doi:10.2173/bna.131

Embry, A.F. 1990. Geological and Geophysical Evidence in Support of the Hypothesis of Anticlockwise Rotation of Northern Alaska. Marine Geology 93:317-329.

Emers, M. and J.C. Jorgenson. 1997. Effects of Winter Seismic Exploration on the Vegetation and Soil Thermal Regime of the Arctic National Wildlife Refuge. In Disturbance and Recovery in Arctic Lands: An Ecological Perspective, R.M.M. Crawford (ed.). Kluwer Academic Publishers, Dordrecht, The Netherlands.

Engas, A., S. Lokkeborg, E. Ona, and A.V. Soldal. 1996. Effects of Seismic Shooting on Local Abundance and Catch Rates of Cod (*Gadus morhua*) and Haddock (*Melanogrammus aeglefinus*). Canadian Journal of Fisheries and Aquatic Sciences 53:2238-2249.

____ and S. Lokkeborg. 2002. Effects of Seismic Shooting and Vessel-generated Noise on Fish Behaviour and Catch Rates. Bioacoustics 12:313-315.

Engelhardt F.R. 1978. Petroleum Hydrocarbons in Arctic Ringed Seals, *Phoca hispida*, Following Experimental Oil Exposure. Proceedings of the Conference on Assessment of Ecological Impacts of Oil Spills, 1978. pp. 614-628.

________. 1982. Hydrocarbon metabolism and cortisol balance in oil-exposed ringed seals, *Phoca hispida*. Comp. Biochem. Physiol. 72C:133-136.

________. 1985. Environmental Issues in the Arctic. POAC 85: The 8TH International Conference on Port and Ocean Engineering under Arctic Conditions. Danish Hydraulic Institute, Horsholm, Denmark. pp. 60-69.

________, J.R. Geraci, T.G. Smith. 1977. Uptake and clearance of petroleum hydrocarbons in the ringed seal, *Phoca hispida*. Journal of the Fisheries Research Board of Canada 34:1143-1147.

Engilis, A. Jr., L.W. Oring, E. Cartera, F.S. Chapin III and A.M. Starfield. 1998. Shorebird surveys in Ensenada Pabellones and Bahia Santa Maria, Sinaloa, Mexico: critical winter habitats for Pacific Flyway shorebirds Wilson Bull. 110: 332-241

Epstein, H.E., M.P. Calef, M.D. Walker, [and others]. 2004. Detecting changes in arctic tundra plant communities in response to warming over decadal time scales. Global Change Biology 10:1325-1334.

Erbe C. and D.M. Farmer. 1998. Masked hearing thresholds of a beluga (*Delphinapterus leucas*) whale in icebreaker noise, Deep-Sea Res. II, 1373-1388.

________. 2000. A software model to estimate zones of impact on marine mammals around anthropogenic noise. J Acoust Soc Am 108:1327–1331

________. 2002. Hearing Abilities of Baleen Whales. Report CR 2002-065. Ottawa, Ont., Canada: Defense Research and Development Canada.

Euskirchen, E.S., A.D. McGuire, F.S. Chapin, III, S. Yi, and C.C. Thompson. 2009. Changes in vegetation in northern Alaska under scenarios of climate change, 2003-2100: implications for climate feedbacks. Ecological Applications 19:1022-1043.

Evans, D.O. 2007. Effects of Hypoxia on Scope-for-Activity and Power Capacity of Lake Trout (*Salvelinus namaycush*). Canadian Journal of Fisheries and Aquatic Sciences 64:345-361.

Everest Consulting Associates. 2007. Environmental Impact Analysis, Appendix A. Analysis of Potential Oil and Hydrocarbon Spills for the Proposed Liberty Development Project In : BP Exploration (Alaska) Inc. Liberty Development Project, Development and Production Plan. Anchorage, AK: BP Exploration (Alaska) Inc.

Everett, K.R. 1980. Disturbance and Properties of Road Dust Along the Northern Portion of the Haul Road. Pages 101-128 In CRREL Report 80-19, J.B. Brown and R.L. Berg (eds.).

________, D.L. Kane, and L.D. Hinzman. 1996. Surface Water Chemistry and Hydrology of a Small Arctic Drainage Basin. *In* Landscape Function and Disturbance in Arctic Tundra, J.F. Reynolds and J.D. Tenhuen (eds.). Springer-Verlag, Berlin, Germany.

Everett, R.J., R.L. Wilmot, and C.C. Krueger. 1997. Population Genetic Structure of Dolly Varden from Beaufort Sea Drainages of Northern Alaska and Canada. Pages 240-249 in J.B. Reynolds, editor. Fish Ecology in Arctic North America, American Fisheries Society Symposium 19.

Evers, D.C., L.J. Savoy, C.R. DeSorbo, [and others]. 2008. Adverse effects from environmental mercury loads on breeding common loons. Ecotoxicology 17:69-81.

Ewing, A.L. 1997. Letter Dated June 11, 1997 to J. Munson, Alaska NPR-A Representative, U.S. Department of Interior Bureau of Land Management, Alaska State Office, From A.L. Ewing, Deputy Commissioner, Alaska Department of Environmental Conservation, Juneau, Alaska.

Exxon Valdez Oil Spill Trustee Council (Exxon). 2010. Exxon Valdez Oil Spill Restoration Plan: Update of Injured Resources and Services May 2010. Exxon Valdez Oil Spill Trustee Council, Anchorage, Alaska. 46 pages.

Fabry, V.J., B.A. Seibel, R.A. Feely, and J.C. Orr. 2008. Impacts of ocean acidification on marine fauna and ecosystem processes. – ICES Journal of Marine Science, 65: 414–432.

________, J.B. McClintock, J.T. Mathis, and J.M. Grabmeier. 2009. Ocean acidification at high latitudes: The Bellwether. Oceanography 22(4): 160-171.

Fair, J. 2010. Scoping e-mail. September 30, 2010.

Fairweather E&P Services, Inc. 2000. Historical Blowout Study, North Slope of Alaska. British Petroleum-Amoco Exploration Alaska, Anchorage, Alaska.

Fall, J.A. and C.J. Utermohle. 1995. An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska. Volume VI. In Alaska Department of Fish and Game (ADFG), Division of Subsistence [ed.], Anchorage, Alaska.

________, R. Miraglia, W. Simeone, C.J. Utermohle, and R.J. Wolfe. 2001. Long-Term Consequences of the Exxon Valdez Oil Spill for Coastal Communities of Southcentral Alaska. Minerals Management Service Outer Continental Shelf Technical Report 163. Alaska Department of Fish and Game, Division of Subsistence, Anchorage, Alaska.

Fancy, S.G., L.F. Pank, K.R. Whitten, and W.L. Regelin. 1989. Seasonal movements of caribou in Arctic Alaska as determined by satellite telemetry. Canadian Journal of Zoology 67:644-650.

Fawcett, M.H., L.L. Moulton, and T.A. Carpenter. 1986. Colville River Fishes. Chapter 2 In Colville River Fish Study (1985) Biological Report. Report by Entrix, Inc., Anchorage, Alaska, for ARCO Alaska, Inc.; North Shore Bureau, Barrow, Alaska; and City of Nuiqsut, Alaska.

Fay, F.H. 1974. The role of ice in the ecology of marine mammals of the Bering Sea. In Hood, D.W., and Kelley, E. J. eds. Oceanography of the Bering Seas. University of Alaska, Fairbanks, Institute of Marine Science. Occasional Publication No. 2, p. 383.

_______. 1982. Ecology and biology of the Pacific walrus, *Odobenus rosmarus divergens*. Naorth American Fauna 72, U.S. Fish and Wildlife Service, Washington, D.C. 279 pp.

_______. 1985. *Odobenus rosmarus*. The American Society of Mammalogists.

_______ and B.P. Kelly. 1980. Mass mortality of walruses (*Odobenus rosmarus*) at St. Lawrence Island, Bering Sea, autumn 1978. Arctic 33:226-245.

_______ and E.H. Follman. 1982. The Arctic fox (*Alopex lagopus*) species account. Issue 3917. Juneau, Alaska: USDOC, NOAA, OCSEAP, 27 pp.

_______ and J.J. Burns. 1988. Maximal feeding depths of walruses. Arctic 41(3):239-240.

_______, B.P. Kelly, and J.L. Sease. 1989. Managing the exploitation of Pacific walruses: a tragedy of delayed response and poor communication. Marine Mammal Science 5:1-16.

_______, L.L. Eberhardt, B.P. Kelly, J.J. Burns, and L.T. Quakenbush. 1997. Status of the Pacific walrus population, 1950-1989. Marine Mammal Science. 13:537-565.

Fay, G., K. Keith, and T. Schwörer. 2010. Alaska Isolated Wind-Diesel Systems: Performance and Economic Analysis, prepared for Alaska Energy Authority, June 2010, 101 pp.

Fechhelm, R.G. 1999. The Effect of New Breaching in a Prudhoe Bay Causeway on the Coastal Distribution of Humpback Whitefish. Arctic 52(4):385-393.

_______. 2001. Status of Pacific Salmon in the Beaufort Sea, 2001. LGL Alaska Research Associates, Inc., Anchorage, Alaska.

_______, P.C. Craig, J.S. Baker, and B.J. Gallaway. 1984. Fish Distribution and Use of Nearshore Waters in the Northeastern Chukchi Sea. LGL Ecological Research Associates, Inc. Prepared for the National Oceanic and Atmospheric Administration, Juneau, Alaska.

_______ and D.B. Fissel. 1988. Wind-aided Recruitment of Canadian Arctic Cisco (*Coregonus autumnalis*) into Alaskan Waters. Canadian Journal of Fisheries and Aquatic Sciences 45:906-910.

_______, J.S. Baker, W.B. Griffiths, and D.R. Schmidt. 1989. Localized Movement Patterns of Least Cisco (*Coregonus sardinella*) and Arctic Cisco (*C. autumnalis*) in the Vicinity of a Solid-fill Causeway. Biological Papers of the University of Alaska 24:75-106.

_______ and W.B. Griffiths. 1990. The Effect of Wind on the Recruitment of Canadian Arctic Cisco (*Coregonus autumnalis*) into the Central Alaskan Beaufort Sea. Canadian Journal of Fisheries and Aquatic Sciences 47:2164-2171.

_______, R.E. Dillinger, Jr., B.J. Gallaway, and W.B. Griffiths. 1992. Modeling of In-situ Temperature and Growth Relationships for Yearling Broad Whitefish in Prudhoe Bay, Alaska. Transactions of the American Fisheries Society 121: 1-12.

_______, W.B. Griffiths, W.J. Wilson, B.J. Gallaway, and J.D. Bryan. 1995. Intra- and Inter-seasonal Changes in the Relative Condition and Proximate Body Composition of Broad Whitefish from the Prudhoe Bay Region of Alaska. Transactions of the American Fisheries Society 124:508-519.

_______, W.B. Griffiths, L.R. Martin, and B.J. Gallaway. 1996. Intra- and Inter-annual Variation in the Relative Condition and Proximate Body Composition of Arctic Ciscoes from the Prudhoe Bay Region of Alaska. Transactions of the American Fisheries Society 125:600-612.

_______, L.R. Martin, B.J. Gallaway, W.J. Wilson, and W.B. Griffiths. 1999. Prudhoe Bay Causeways and the Summer Coastal Movements of Arctic Cisco and Least Cisco. Arctic 52(2):139-151.

_______, B. Streever, and B.J. Gallaway. 2007. The Arctic Cisco (*Coregonus autumnalis*) Subsistence and Commercial Fisheries, Colville River, Alaska: A Conceptual Model. Arctic 60(4):421-429.

Ferguson, D.E. 1997. The Gallagher Flint Station, Locality 1: A Reappraisal of a Proposed Late Pleistocene Site in the Sagavanirktok River Valley, Arctic Alaska. Master's thesis, Department of Anthropology, University of Alaska, Fairbanks.

Ficke, A.D., C.A. Myrick, and L.J. Hansen. 2007. Potential Impacts of Global Climate Change on Freshwater Fisheries. Reviews in Fish Biology and Fisheries 17:581-613.

Field, R. 1993. Bird-habitat associations on the coastal plain of northcentral Alaska. Unpubl. rep., U.S. Fish Wildl. Serv., Anchorage, AK.

Fingas, M.F. 1996. The Evaporation of Oil Spills: Variation with Temperature and Correlation with Distillation Data. Pages 29-72 In Proceedings of the Nineteenth Arctic and Marine Oilspill Program (AMOP) Technical Seminar, June 12-14, 1996, Calgary, Alberta. Volume I. Environment Canada, Ottawa, Ontario.

_______. 2001. The Basics of Oil Spill Cleanup. Lewis Publishers, Boca Raton, FL.

Finneran J.J., D.A. Carder., S.H. Ridgeway. 2002. Low frequency acoustic pressure, velocity, and intensity thresholds in a bottlenose dolphin (*Tursiops truncatus*) and white whale (*Delphinapterus leucas*). Journal of the Acoustical Society of America 111:447-456.

______, **R. Dear, D.A. Carder, S.H. Ridgway. 2003.** Auditory and behavioral responses of California sea lions (*Zalophus californianus*) to single underwater impulses from an arc-gap transducer. Journal of the Acoustical Society of America 114(3):1667-1677.

Fiorillo, A.R. and R.A. Gangloff. 2000. Theropod teeth from the Prince Creek Formation (Cretaceous) of northern Alaska, with speculations on Arctic dinosaur paleoecology. *Journal of Vertebrate Paleontology* 20: 675–682.

______, **R.S. Tykoski, P.J. Currie, P.J. McCarthy, and P. Flaig. 2009.** Description of two partial Troodon braincases from the Prince Creek Formation (Upper Cretaceous), North Slope, Alaska. *Journal of Vertebrate Paleontology* 29: 178–187.

Fischbach, A.S., D.H. Monson, and C.V. Jay. 2009. Enumeration of Pacific walrus carcasses on beaches of the Chukchi Sea in Alaska following a mortality event, September 2009: U.S. Geological Survey Open-File Report 2009-1291, 10 p.

Fischer, J.B., T.J. Tiplady, and W.W. Larned. 2002. Monitoring Beaufort Sea Waterfowl and Marine Birds, Aerial Survey Component. Outer Continental Shelf Study, MMS 2002-002. U.S. Department of Interior, U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Anchorage, Alaska.

Fladmark, K.R. 1979. Routes: Alternate Migration Corridors for Early Man in North America. *American Antiquity* 44:55-69.

Fleming, D.F. and J.B. Reynolds. 1991. Effects of Spawning-run Delay on Spawning Migration of Arctic Grayling. American Fisheries Society Symposium 10: 299-305.

Flint, P. L., M.R. Petersen, and J.B. Grand. 1997. Exposure of Spectacled Eiders and other diving ducks to lead in western Alaska. Canadian Journal of Zoology 75:439-443

______, **J.B. Grand, J.A. Morse, T.F. Fondell. 2000.** Late summer survival of adult female and juvenile spectacled eiders on the Yukon-Kuskokwim Delta, Alaska. Waterbirds 23:292-297.

______, **J.A. Reed, J.C. Franson, T.E. Hollmen, J.B. Grand, M.D. Howell, R.B. Lanctot, D.L. Lacroix, and C.P. Dau. 2003.** Monitoring Beaufort Sea Waterfowl and Marine Birds. OCS Study Minerals Management Service 2003-037. U.S. Geological Service, Alaska Science Center, Anchorage, Alaska.

______, **E.J. Mallek, R.J. King, J.A. Schmutz, K.S. Bollinger, and D.V. Derksen. 2007.** Changes in abundance and spatial distribution of geese molting near Teshekpuk Lake, Alaska: interspecific competition or ecological change? Polar Biology. DOI 10.1007/s00300-007-0386-8.

Flint V.E., R.L. Boehme, Y.V. Kostin, and A.A. Kuznetsov. 1984. A Field Guide to Birds of the USSR. including eastern Europe and central Asia. Transl. by N. Bourso-Leland. Princeton Univ. Press. Princeton, NJ.

Flora, S. 2004. Trimble GPS data; Susan Flora, environmental scientist, Bureau of Land Management

________. **2005.** Shoreline Erosion Program Field Work Results using Trimble Pro XR GPS data.

________. **2010.** "Locations of Driftwood and Upper Meade River abandoned drum caches", Field Trip Report Susan Flora, environmental scientist, Bureau of Land Management.

Flores, R.M., Stricker, G.D., and Kinney, S.A. 2004. Alaska Coal Geology, Resources, and Coalbed Methane Potential, U.S. Geological Survey, DDS-77.

Fogg, J. and H. Hadley. 2007. Hydraulic Considerations for Pipelines Crossings Stream Channels. Bureau of Land Management, Denver, CO. Technical Note 423.

Fong, T.T. and E.K. Lipp. 2005. Enteric viruses of humans and animals in the aquatic environments: health risks, detection, and potential water quality assessment tools. Microbiology and Molecular Biology Reviews. 69(2): 357-371.

Foote, D.C. 1964. American Whalemen in Northwestern Arctic Alaska. *Arctic Anthropology* 2(2):16-22.

Force, E.R., S. Paradis, and G.J.Simandl. 1999. Sedimentary Manganese; in Selected British Columbia Mineral Deposit Profiles, Volume 3, Industrial Minerals, G.J. Simandl, Z.D. Hora and D.V. Lefebure, Editors, British Columbia Ministry of Energy and Mines.

Ford, J.B. 1959. Eskimo Prehistory in the Vicinity of Point Barrow, Alaska. *Anthropological Papers of the American Museum of Natural History* 47(2).

Ford, J.K.B., G.M. Ellis, and K.C. Balcomb. 2000. Killer Whales. University of British Columbia Press, Vancouver, Toronto, Canada; University of Washington Press, Seattle. 104 p.

Ford, R.G. 1985. Oil Slick Sizes and Length of Coastline Affected: A Literature Survey and Statistical Analysis. U.S. Department of the Interior, Minerals Management Service, Pacific Outer Continental Shelf Region, Los Angeles, California.

Francis, J.A., D.M. White, J.J. Cassano, W.J. Gutowski, Jr., L.D. Hinzman, M.M. Holland, M.A. Steele, and C.J. Vorosmarty. 2009. An Arctic Hydrologic System in Transition: Feedbacks and Impacts on Terrestrial, Marine, and Human Life. Journal of Geophysical Research 114(G04019):doi:10.1029/2008JG000902.

Frankel, A.S. 2009. Sound production. *In:* Perrin WF, Würsig B, Thewissen HGM (eds.), Encyclopedia of Marine Mammals 2nd ed. Academic Press, San Diego, CA. 1316 p.

Franson, J.C., M.R. Petersen, L.H. Creekmore, P.L. Flint, and M.R. Smith. 1998. Blood Lead Concentrations of Spectacled Eiders Near the Kashunuk Rover, Yukon Delta National Wildlife Refuge, Alaska. Ecotoxicology 7:175-181.

Fredrickson, L.H. 2001. Steller's Eider (*Polysticta stelleri*). In The Birds of North America, No. 571 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Free, A.P., J.C. Cox, and L.A. Schultz. 1982. Laboratory Studies of Oil Spill Behavior in Broken Ice Fields. Pages 3-14 In Proceedings of the Fifth Arctic Marine Oil Spill Program Technical Seminar, June 15-17, 1982, Edmonton, Alberta. Environment Canada, Ottawa, Ontario.

Fried, N. 2010. The Cost of Living in Alaska. Alaska Department of Labor and Workforce Development. Alaska Economic Trends. August 2010, Volume 30, No. 8. http://labor.state.ak.us/trends/aug10.pdf

_______**. 2011.** Employment Scene, "Statewide Employment" Table. Trends November 2011, Volume 31, No. 11. Alaska Department of Labor and Workforce Development http://labor.state.ak.us/trends/nov11.pdf

_______ **and B. Windisch-Cole. 2005.** The Northern Region. Alaska Department of Labor and Workforce Development. Alaska Economic Trends: March 2005, Volume 25, No 3. http://labor.state.ak.us/trends/mar05.pdf

Fritz, S. 2008. Surveys of residents. July – Oct., 2008. Aklavik and Shingle Point, Yukon Territory, Canada and Kaktovik and Barrow, Alaska.

_______**. 2009.** Surveys of residents. Aug. – Oct., 2009. Barrow, Wainwright, and Point Lay, Alaska.

_______**. 2010.** DEW Line Passage: Tracing the Legacies of Arctic Militarization. PhD Dissertation. University of Alaska Fairbanks.

Frost, K.J., L.F. Lowry, and J.J. Burns. 1982. Distribution of marine mammals in the coastal zone of the Bering Sea during summer and autumn. U.S. Dep. Commer., NOAA, OCSEAP Environ. Asses. Alaskan Continental Shelf, Final Rep., Biol. Stud. 20:365-561.

_______ **and L.F. Lowry. 1983.** Demersal Fishes and Invertebrates Trawled in the Northeastern Chukchi and Western Beaufort Seas, 1976-77. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Technical Report NMFS SSRF-764.

_______**, L.F. Lowry, and J.J. Burns. 1983.** Distribution of marine mammals in the coastal zone of the eastern Chukchi Sea during summer and autumn. U.S. Dep. Commer., NOAA, OCSEAP Environ. Asses. Alaskan Continental Shelf, Final Rep., Biol. Stud. 20:563-650.

_______**. 1984.** Trophic Relationships of Vertebrate Consumers in the Alaskan Beaufort Sea. Pages 381-401 In P.W. Barnes, D. M. Schell & E. Reimnitz, editors. The Alaskan Beaufort Sea. Ecosystem and Environments. Academic Press, London.

_______ **and L.F. Lowry. 1990.** Distribution, abundance, and movements of beluga whales, *Delphinapterus leucas*, in coastal waters of western Alaska. Pp. 39-57 *In* T. G. Smith, D. J. St. Aubin, and J. R. Geraci (eds.), Advances in research on the beluga whale, *Delphinapterus leucas*. Can. Bull. Fish. Aquat. Sci. 224.

_______**, L.F. Lowry, and G. Caroll. 1993.** Beluga whale and spotted seal use of a coastal lagoon system in the northeastern Chukchi Sea. Arctic 46:8-16.

_______, **C.A. Manen, and T.L. Wade. 1994.** Petroleum hydrocarbons in tissues of harbor seals from Prince William Sound and the Gulf of Alaska. Pages 331-358 in TR Loughlin, editor. Marine Mammals and the Exxon Valdez. Academic Press, Inc., San Diego, CA.

_______ **and L.F. Lowry. 1995.** Radio tag based correction factors for use in beluga whale population estimates. Working paper for Alaska Beluga Whale Committee Scientific Workshop, Anchorage, AK, 5-7 April 1995. 12 pp. (available upon request- Alaska Dep. Fish and Game, 1300 College Rd., Fairbanks, AK 99701).

_______, **L.F. Lowry, G. Pendleton, and H.R. Nute. 2002.** Monitoring distribution and abundance of ringed seals in northern Alaska. OCS Study MMS 2002-04. Final report from the Alaska Dep. Fish and Game, Juneau, AK, for U.S. Minerals Management Service, Anchorage, AK. Pp. 66.

_______ **and R.S. Suydam. 2010.** Subsistence harvest of beluga or white whales (*Delphinapterus leucas*) in northern and western Alaska, 1987-2006. Journal of Cetacean Research and Management 11:293-299.

Fuller, A.S. and J.C. George. 1997. Evaluation of subsistence harvest data from the North Slope Borough 1993 census for eight North Slope villages: for the calendar year 1992. unpublished report. North Slope Borough, Dept. of Wildlife Management. Barrow, Alaska.

_______ **and J.C. George. 1999.** Evaluation of Subsistence Harvest Data from the North Slope Borough 1993 Census for Eight North Slope Villages for the Calendar Year 1992. North Slope Borough, Department of Wildlife Management, Barrow, Alaska.

Funk, D.W., E.R. Pullman, K.M. Peterson, P.M. Crill, and W.D. Billings. 1994. Influence of water table on carbon dioxide, carbon monoxide, and methane fluxes from taiga bog microcosms. Global Biogeochemical Cycles 8:271-278.

_______, **L.E. Noel, and A.H. Freedman. 2004.** Environmental Gradients, Plant Distribution, and Species Richness in Arctic Salt Marsh Near Prudhoe Bay, Alaska. Wetlands Ecology and Management 12:215-233.

_______, **R. Rodrigues, D.S. Ireland, and W.R. Koski. 2010.** Summary and assessments of potential effects on marine mammals. Chapter 11 *In*: Joint Monitoring Program in the Chukchi and Beaufort seas, July–November 2006-2008. LGL Alaska Report P1050-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., Bioacoustics Research Program, Cornell University, and JASCO Applied Sciences, for Shell Offshore, Inc., other Industry contributors, the National Marine Fisheries Service and the U.S. Fish and Wildlife Service.

Furniss, M.J., T.D. Roelofs, and C.S. Lee. 1991. Road Construction and Maintenance. Pages 297-323 in W.R. Meehan, editor. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, MD.

Furniss, R.A. 1974. Inventory and Cataloging of Arctic Area Waters. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 15:1-45.

Gaboury, M.N. and J.W. Patalas. 1984. Influence of Water Level Drawdown on the fish Populations of Cross Lake, Manitoba. Canadian Journal of Fisheries and Aquatic Sciences 41:118-125.

Gabriele, C.M., A.S. Jensen, J.L. Neilson, and J.M. Straley. 2007. Preliminary summary of reported whale-vessel collisions in Alaskan waters: 1978-2006.Paper SC/59/BC16 presented to the IWC Scientific Committee, June 2007, Anchorage, Alaska, USA. 5pp. [Paper available at the Office of this Journal] [2007]

Gabrielson, I.N. and F.C. Lincoln. 1959. Birds of Alaska. Stackpole Publishing Co., Harrisburg, Pennsylvania.

Galganaitis, M. and D.W. Funk. 2005. Annual Assessment of Subsistence Bowhead Whaling Near Cross Island, 203: ANIMIDA Task 4 Annual Report. Prepared for U.S. Department of the Interior Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

________**. 2006.** Personal communication via email, December 30, 2006.

________**. 2006.** Summary of the 2005 whaling season at Cross Island. Applied Sociocultural Research, 608 W. 4th Ave, Suite 31, Anchorage, AK.

________**. 2009.** Annual Assessment of Subsistence Bowhead Whaling Near Cross Island, 2001-2007 Applied Sociocultural Research. Prepared for USDOI, MMS. OCS Study MMS 2009-038., Anchorage, AK.

Gallant, A.L., E.F. Binnian, J.M. Omernik, and M.B. Shasby. 1996. Ecoregions of Alaska: U.S. Geological Survey Professional Paper 1567, 73 p. 1 plate [map folded in pocket], scale 1:5,000,000.

Gallaway, B.J. 1990. Factors Limiting the Growth of Arctic Anadromous Fish Populations. Pages 57-71 in R.M. Meyer and T.M. Johnson, editors, Fisheries Oceanography - A Comprehensive Formulation of Technical Objectives for Offshore Application in the Arctic: Workshop Proceedings. MBC Applied Environmental Sciences, Costa Mesa, California.

________**, W.J. Gazey, and L.L. Moulton. 1989.** Population Trends for the Arctic Cisco (*Coregonus autumnalis*) in the Colville River of Alaska as Reflected by the Commercial Fishery. Biological Papers of the University of Alaska 24:153-165.

________**, R.G. Fechhelm, W.B. Griffiths, and J.G. Cole. 1997.** Broad Whitefish (*Coregonus autumnalis*) Population Dynamics in the Prudhoe Bay Region of Alaska: Classical Density-dependence? American Fisheries Society Symposium 19:274-286.

Gambell, R. 1985. Fin whale, *Balaenoptera physalus* (Linnaeus 1758). *In*: S.H. Ridgeway and R. Harrison (eds), Handbook of Marine Mammals, pp. 171-192. Academic Press, London, UK

Gangloff, R.A. 1997. Paleontological Resources in the Northeast Planning Area of the NPR-A. Paper presented at the NPR-A Symposium: Environmental and Subsistence Resources in the Northeast Planning Area of the National Petroleum Reserve in Alaska, Anchorage, Alaska, April 16-18, 1997, USDOI, Bureau of Land Management.

_______, A.R. Fiorillo, and D.W. Norton. 2005. The first pachycephalosaurine (Dinosauria) from the paleo-Arctic of Alaska and its paleogeographic implications. *Journal of Paleontology* 79: 997–1001.

_______ and A.R. Fiorillo. 2010. Taphpnomy and Paleoecology of a Bonebed from the Prince Creek Formation, North Slope, Alaska. *Palaios*, 25: 299-317.

Garlich-Miller, J.L., L.T. Quakenbush, and J.F. Bromaghin. 2006. Trends in age structure and productivity of pacific walruses harvested in the Bering Strait region of Alaska, 1952-2002. Marine Mammal Science 22(4):880-896.

Garner, G.W. and P.E. Reynolds (eds.). 1986. Impacts of Further Exploration, Development and Production of Oil and Gas Resources. In Arctic National Wildlife Refuge Coastal Plain Resource Assessment, Final Report. Baseline study of Fish, Wildlife, and Their Habitats, Volume II. U.S. Department of the Interior, Fish and Wildlife Service, Anchorage, Alaska.

_______, L.L. McDonald, D.S. Robson, D.P. Young Jr., and S.M. Arthur. 1992. Literature review: population estimation methodologies applicable to the estimation of abundance of polar bears. Internal Report, USFWS. 102pp.

Garroutte, E.M., J. Goldberg, J. Beals, R. Herrell, and S.M. Manson. 2003. Spirituality and attempted suicide among American Indians. Social Science and Medicine 56: 1571-1579.

Gaskin, D.E. 1984. The Harbour Porpoise, *Phocoena phocoena* (L.): Regional populations, status, and information on direct and indirect catches. Report to the International Whaling Commission 34:569-586.

Gavin, A. 1983. Spring and summer caribou movements, Prudhoe Bay, 1969-1979. Report to Atlantic Richfield Co., Los Angeles, California.

Geist, O.W., J.T. Buckley, and R.H. Manville. 1960. J. Mammalogy. 412:250-253.

_______. 1997. Member of the blue whale family washes ashore at Barrow, AK. Unpublished report to North Slope Borough, Department of Wildlife Management, Barrow, AK. 8 September 1997.

General Accounting Office (GAO). 2002. Alaska's North Slope, Requirement for Restoring Lands after Oil Production Ceases. GAO-02-357. Report to Congressional Requesters. Washington, DC.

George, C. 2006. Personal Communication: Chinook salmon catches off of Point Barrow. Electronic mail correspondence on April 04, 2006.

George, J.C. and B.P. Nageak. 1986. Observations on the Colville River Subsistence Fishery at Nuiqsut, Alaska for the Period July 4 - November 1, 1984. North Slope Borough, Barrow, Alaska

_______ and R. Kovalsky. 1986. Observations on the Kupigruak Channel (Colville River) Subsistence Fishery, October, 1985. North Slope Borough, Barrow, Alaska

________, L.M. Philo, K. Hazard, D. Withrow, G.M. Carroll, and R. Suydam. 1994. Frequency of Killer Whale (*Orcinus orca*) attacks and ship collisions based on scarring on Bowhead Whales (*Balaena mysticetus*) of the Bering-Chukchi-Beaufort Seas stock. Arctic 47:247-255.

________ and R. Suydam. 1998. Observations of Killer whale (*Orcinus orca*) predation in the northeastern Chukchi and western Beaufort seas. Marine Mammal Science 14:330-332.

________, J. Bada, J. Zeh, L. Scott, S.E. Brown, T. O'Hara, and R. Suydam. 1999. Age and growth estimates of bowhead whales (*Balaena mysticetus*) via aspartic acid racemization. Canadian Journal of Zoology 77:1-10.

________, J. Zeh, R. Suydam, and C. Clark. 2004. Abundance and population trend (1978-2001) of western Arctic bowhead whales surveyed near Barrow, Alaska. Mar. Mammal Sci. 20:755-773.

________, H. Huntington, K. Brewster, H. Eicken, D.W. Norton, and R. Glenn. 2004. Observations on shorefast ice dynamics in Arctic Alaska and the responses of the Iñupiat hunting community. Arctic 57(4): 363-374.

________, C. Nicolson, S. Drobot, and J. Maslanik. 2005. Progress Report: Sea Ice Density and Bowhead Whale Body Condition. Paper SC/57/E13 presented to the IWC Scientific Committee, Ulsan Korea.

________ and R. Suydam. 2009. Recent observations of narwhal in the Chukchi and Beaufort seas by local hunters. Unpublished manuscript. North Slope Borough Department of Wildlife Management, Barrow, AK.

________, G. Sheffield, and L. Dehn. 2011. Section V-North Slope Borough Research. pp. 50-61 In: Bowhead Whale Feeding Ecology Study (BOWFEST) in the western Beaufort Sea 2010 Annual Report. Submitted to BOEM, Anchorage, Alaska.

Georgette, S. and H. Loon. 1988. The Noatak River: Fall Caribou Hunting and Airplane Use. Technical Paper 162. Alaska Department of Fish and Game, Division of Subsistence, Anchorage, Alaska.

________. 2000. Subsistence Use of Birds in the Northwest Arctic Region, Alaska. Technical Paper 162. Alaska Department of Fish and Game, Division of Subsistence, Anchorage, Alaska.

Geraci, J.R. and T.G. Smith. 1977. Consequences of oil fouling on marine mammals. Pages 399-410 In: Malins DC, (ed.) Effects of petroleum on arctic and subarctic marine environments and organisms. Vol. II. Biological effects. Academic Press, New York. 500pp.

Gerlach, S.C. and E.S. Hall, Jr. 1988. The Later Prehistory of Northern Alaska: The View from Tukuto Lake. In *The Late Prehistoric Development of Alaska's Native People*, edited by R.D. Shaw, R.K. Harritt, and D.E. Dumond, pp. 107-135. Aurora: Alaska Anthropological Association Monograph Series No. 4.

Gersper, P.L., V. Alexander, S.A. Barkley, R.J. Barsdate, and P.S. Flint. 1980. The Soils and Their Nutrients. *In* An Arctic Ecosystem: The Coastal Tundra at Barrow, Alaska, J. Brown, P.C. Miller, L.L. Tiezen, and F.L. Bunnell (eds.). US/IBP Synthesis Series US12. Dowden, Hutchinson, and Ross, Stroudsburg, Pennsylvania.

Gessner, B. and C. Utermohle. 2006. Asthma in Alaska: 2006 Report. State of Alaska Department of Health and Social Services, Anchorage, Alaska.

Gibson D.D. and G.V. Byrd. 2007. Birds of the Aleutian Islands, Alaska. Nuttall Ornithological Club and The American Ornithologists' Union, Washington, D.C.

Giddings, J.L., Jr. 1951. The Denbigh Flint Complex. *American Antiquity* 16(3):193-202.

_______. 1957. Round Houses in the American Arctic. *American Antiquity* 23(2):121-135.

_______ and D. D. Anderson. 1986. *Beach Ridge Archaeology of Cape Krusenstern: Eskimo and Pre Eskimo Settlements Around Kotzebue Sound, Alaska.* Publications in Archaeology 20, National Park Service, U. S. Department of the Interior. Washington DC.

Gilchrist, H.G. 2001. Glaucous Gull (*Larus hyperboreus*). *In* The Birds of North America, No. 573 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Gilders, M.A., and M.A. Cronin. 2000. North Slope Oil Field Development. Pages 15-32 *In* The Natural History of an Arctic Oil Field, J.C. Truett and S.R. Johnson (eds.). Academic Press, San Diego, California.

Gill, R.E., M.R. Petersen, and P.D. Jorgensen. 1981. Birds of Northcentral Alaska Peninsula, 1978-80. Arctic 34:286-306.

_______ and C.M. Handel. 1990. The importance of subarctic intertidal habitats to shorebirds: A study of the central Yukon-Kuskokwim Delta, Alaska. Condor 92:709-725.

_______,T. Piersma, G. Hufford, R. Servranckx, and A. Riegen. 2005. Crossing the ultimate ecological barrier: evidence for an 11,000-km-long non-stop flight from Alaska to New Zealand and Eastern Australia by Bar-tailed Godwits. Condor 107:1-20.

Gilliam, J.K. and P.C. Lent (eds.) 1982. Proceedings of NPR-A caribou/waterbird impact analysis workshop. Bureau of Land Management, Anchorage, AK

Gingrich, D. 2001. The Alpine Field after the First Year. Oral Presentation Given at the December 13, 2001 Luncheon Meeting of the Geophysical Society of Alaska in Anchorage.

Glaeser, J.L. and G. Vance. 1971. A Study of the Behavior of Oilspills in the Arctic. Report AD 717 142. U.S. Coast Guard, Washington, D.C.

Goddard Institute for Space Studies. 2007. Annual Mean Temperature Change for Three Latitude Bands. Datasets & Images, GISS Surface Temperature Analysis, Analysis Graphs and Plots, New York, New York. Available online at: http://data.giss.nasa.gov/gistemp/graphs/Fig.B.lrg.gif

Goebel, T., M.R. Waters, and D.H. O'Rourke. 2008. The Late Pleistocene Dispersal of Modern Humans in the Americas, *Science* 319: 1497-1502.

Goetz, K.T., D.J. Rugh, and J.A. Mocklin. 2009. Section I - Aerial Surveys Of Bowhead Whales In The Vicinity Of Barrow August-September 2009. National Marine Mammal Laboratory Alaska Fisheries Science Center National Marine Fisheries Service, NOAA 7600 Sand Point Way NE Seattle, Washington 98115.

Goldenberg, S.M., J.A. Shoveller, A.C. Ostry, and M. Koehoorn. 2008. Sexually transmitted infection (STI) testing among young oil and gas workers: the need for innovative, place-based approaches to STI control. Canadian Journal of Public Health 99(4): 350-354.

Goldsmith, S.O., J. Angvik, L. Howe, A. Hill, L. Leask. 2004. The Status of Alaska Natives Report 2004. Institute of Social and Economic Research, University of Alaska Anchorage.

Goodman, E. 2011. The Makeup of Alaska's Population, Alaska Economic Trends June 2011, Volume 31, No. 6. Alaska Department of Labor and Workforce Development. http://labor.state.ak.us/trends/jun11.pdf

Gollop, M.A., J.E. Black, B.E. Felske, and R.A. Davis. 1974a. Disturbance Studies of Breeding Black Brant, Common Eiders, Glaucous Gulls and Arctic Terns at Nunaluk Spit and Philips Bay, Yukon Territory, July 1972. In Arctic Gas Biological Report Series No. 14.

________, J.R. Goldsberry, and R.A. Davis. 1974b. Effects of Gas Compressor Noise Simulator Disturbance to Terrestrial Breeding Birds, Babbage River, Yukon Territory, June, 1972. In Arctic Gas Biological Report Series No. 14.

Golnick, C. 2009. Alaska Community Health Aide/Practitioner Clinical Practice Description. Alaska Community Health Aide Program, Alaska Area Native Health Program: [http://www.akchap.org/resources/chap_library/Clinical%20Practice/CHAP_Clinical_Practice_1209Golnick.pdf]

Gordian, M.E. 2004. Air Quality in Alaska Asthma Studies presentation. Institute for Circumpolar Health Studies, University of Alaska Anchorage.

Götmark, F. 1992. The Effect of Investigator Disturbance on Nesting Birds. Current Ornithology 9:63-104.

Gotthardt, T. and R. Lanctot. 2002. Status report on the Buff-breasted Sandpiper (*Tryngites subruficollis*). Unpublished report prepared for the USFWS (Ecological Services), Anchorage AK. 49pp.

Goudie, A.S. 2009. Paleoclimate - Evidence for Past Climatic Changes, Climatic Changes in the Geological Record, The Cenozoic Climate Decline http://www.libraryindex.com/pages/3368/Paleoclimate.html#ixzz1CfN4PgHX

Goudie, R.I., G.J. Robertson, and A. Reed. 2000. Common Eider (*Somateria mollissima*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/546 doi:10.2173/bna.546

Graham, G.E., M. Deszcz-Pan, J. Abraham, and K.D. Kelley. 2011. Investigation of the potential for concealed base-metal mineralization at the Drenchwater Creek Zn-Pb-Ag occurrence, northern Alaska, using geology, reconnaissance geochemistry, and airborne electromagnetic geophysics in Dumoulin, J.A., and Dusel-Bacon, C., eds., Studies by the U.S. Geological Survey in Alaska, 2010: U.S. Geological Survey Professional Paper 1784–B, 19 p.

Grand, J.B., P.L. Flint, M.R. Petersen, and C.L. Moran. 1998. Effect of lead poisoning on spectacled eider survival rates. J. Wildl. Management. 62:1103-1109.

Grantz, A. and S.D. May. 1982. Rifting History and Structural Development of the Continental Margin North of Alaska. In Studies in Continental Margin Geology, J.S. Watkins and C.L. Drake (eds.). Memoir 34. American Association of Petroleum Geologists.

Gratto-Trevor, C.L. 1992. Semipalmated Sandpiper (*Calidris pusilla*). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Laboratory of Ornithology; Retrieved from The Birds of North American Online database: http://bna.birds.cornell.edu/BNA/demo/account/Semipalmated_Sandpiper/.

Gray, D.M. and T.D. Prowse. 1993. Snow and floating ice. *In*: D.R. Maidment (ed.). Handbook of Hydrology, pp. 7.1–7.58. McGraw-Hill.

Great Bear. 2011. Great Gear Petroleum LLC: Corporate Presentation, Alaska State Capital: Juneau, February 26, 2011.Petroleum News, 2011, North Slope production down 4.7% in May, Vol. 16, No. 23, June 5, 2011.

Grebemeier, J.M., J.E. Overland, S.E. Moore, [and others]. 2006. A major ecosystem shift in the northern Bering Sea. Science 311:1461-1464.

Greene, C.R. 2000. Vibrator Sounds in a Frozen Arctic Lake during a Winter Seismic Survey. Report prepared by Greeneridge Sciences, Inc., Santa Barbara, CA for Western Geophysical, Anchorage, AK.

Griffith, B., D.C. Douglas, N.E. Walsh, [and others]. 2002. The Porcupine Caribou Herd-Part 1. Section 3 in Arctic Refuge Coastal Plain Terrestrial Wildlife Research Summaries. D.C. Douglas and P.E. Reynolds (eds.). Biological Science Report USGS/BRD/BSR-2002-0001. U.S. Geological Survey, Biological Resources Division. Available online at: http://alaska.usgs.gov/BSR-2002/pdf/usgs-brd-bsr-2002-0001-sec03.pdf.

Griffiths, W.B. and B.J. Gallaway. 1982. Prudhoe Bay Waterflood Fish Monitoring Program 1981. Report Prepared by LGL Alaska Research Associates, Inc., for U.S. Army Corps of Engineers, Alaska District, Anchorage, Alaska.

________, B.J. Gallaway, W.G. Gazey, and R.E. Dillinger, Jr. 1992. Growth and Condition of Arctic Cisco and Broad Whitefish as Indicators of Causeway-induced Effects in the Prudhoe Bay Region, Alaska. Transactions of the American Fisheries Society 121:557-577.

Groot, C. and L. Margolis. 1991. Pacific Salmon Life Histories. University of Washington Press.

Groves, D.J., B. Conant, R.J. King, J.I. Hodges, and J.G. King. 1996. Status and Trends of Loon Populations summering in Alaska, 1971-1993. Condor 98:189-195.

Groves, P, D.H. Mann, and M.L. Kunz. 2009. Muskox Genetics: DNA from Ancient Permafrost Bones to the Present. Program and Abstracts, Annual Meeting of the American Society of Mammalogists, Fairbanks, Alaska

Gryc, G., ed. 1985. The National Petroleum Reserve in Alaska: Earth-science Considerations. U.S. Geological Survey Professional Paper 1240-C. U.S. Geological Survey. 93 pages.

________. 1988. Geology and exploration of the National Petroleum Reserve in Alaska, 1974 to 1982: U.S. Geological Survey Professional Paper 1399, 940 p.

Gulf Canada Resources, Inc. Analysis of Accidents in Offshore Operations Where Hydrocarbons Were Lost. Canada; 1982 (Beaufort E.I.S. Support Document).

Gunn, J.M. 2002. Impact of the 1998 El Nino Event on a Lake Charr, *Salvelinus namaycush*, Population Recovering from Acidification. Environmental Biology of Fishes 64:343-351.

Gusey, W.F. 1982. The Fish and Wildlife Resources of the National Petroleum Reserve - Alaska. Environmental Affairs, Shell Oil Company, Houston, Texas.

________. 1988. The Fish and Wildlife Resources of the Chukchi Sea Region. Shell Western E & P, Inc., Houston, Texas.

Guthrie, D.R. 1990. Frozen Fauna of the Mammoth Steppe. University of Chicago Press

________. 2006. New carbon dates link climatic change with human colonization and Pleistocene extinctions. *Nature*. 441:207-209.

________ and S. Stoker. 1990. Paleoecological Significance of Mummified Remains of Pleistocene Horses from the North Slope of the Brooks Range. *Arctic* 43:267-274.

Gutreuter, S., J.M. Vallazza, and B.C. Knights. 2006. Persistent Disturbance by Commercial Navigation Alters the Relative Abundance of Channel-Dwelling Fishes in a Large River. Canadian Journal of Fisheries and Aquatic Sciences 63:2418-2433.

Hablett, T.R. 1979. Fish Inventories Conducted within the National Petroleum Reserve on the North Slope of Alaska, 1977-78. Pages 337-406. In: Studies of Selected Wildlife and Fish and Their Use of Habitats on and Adjacent to the National Petroleum Reserve in Alaska, 1977-1978, P.C. Lent, ed. 105(c) Land Use Study Volume 2. Anchorage, Alaska: USDOI, BLM, NPR-A Work Group 3.

Hadland, J., A. Wink, A. Soden, and B. Laurent. 2006. Nonresidents Working in Alaska - 2004. Alaska Department of Labor and Workforce Development. Juneau, Alaska.

Haley, B., C. Reiser, J. Beland, and D. Savarese. 2009. Chukchi Sea vessel-based seismic monitoring. (Chapter 5) *In*: Ireland, D.S., R. Rodrigues, D. Funk, W. Koski, D. Hannay. (eds.) 2009. Marine mammal monitoring and mitigation during open water seismic exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July–October, 2008: 90-day repot. LGL Rep P1049-1. Rep. from LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. for Shell Offshore Inc., Nat. Mar. Fish. Serv., and U.S. Fish and Wild. Serv. 277 pp, plus appendices.

________, J. Beland, D.S. Ireland, R. Rodrigues, and D.M. Savarese. 2010. Chukchi Sea vessel-based monitoring program. (Chapter 3) In: Funk DW, Ireland DS, Rodrigues R, and Koski WR (eds.). Joint Monitoring Program in the Chukchi and Beaufort seas, open water seasons, 2006–2008. LGL Alaska Report P1050-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., and JASCO Research, Ltd., for Shell Offshore, Inc. and Other Industry Contributors, and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 506 p. plus Appendices.

Hall, E.S. Jr. 1976. A Preliminary Analysis of House Types at Tukuto Lake, Northern Alaska. In Contributions to Anthropology: The Interior Peoples of Northern Alaska, edited by Edwin S. Hall, Jr., pp. 98-134. Mercury Series, Archaeological Survey of Canada Paper No. 49, National Museum of Man, Ottawa.

________. 1978. Technological Change in Northwestern Alaska. In *Archaeological Essays in Honor of Irving B. Rouse*, edited by R.C. Dunnell and E.S. Hall Jr. (pp.209-229). Mouton, The Hague.

________, S.C. Gerlach, and M.B. Blackman. 1985. In the National Interest: A Geographically Based Study of Anaktuvuk Pass Inupiat Subsistence Through Time. 2 Volumes. North Slope Borough, Barrow, Alaska.

________ and R. Gal. 1988. The U.S. Geological Survey, Bureau of Land Management Cultural Resource Management Program in the National Petroleum Reserve in Alaska, 1977-1981. In *Geology and Exploration in the National Petroleum Reserve in Alaska, 1974-1982*, edited by G. Gryc, pp. 89-97. Geological Survey Professional Paper 1399. U.S. Government Printing Office, Washington D,C.

Hall, J.D., M. Gallagher, K. Brewer, P. Regos, and P. Isert. 1994. 1993 Kuvlum Exploration Area Site Specific Monitoring Program. Prepared for ARCO Alaska, Inc., Anchorage, Alaska, by Coastal and Offshore Pacific Corporation, Walnut Creek, California.

Hall, T.E., H. Heaton, and L.E. Kruger. 2009. Outdoor recreation in the Pacific Northwest and Alaska: trends in activity participation. Gen. Tech. Rep. PNW-GTR-778. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 108p.

Hamilton, C.I., S.J. Starr, and L.L. Trasky. 1979. Recommendations for Minimizing the Impacts of Hydrocarbon Development on Fish, Wildlife, and Aquatic Plant Resources of Lower Cook Inlet. Volumes I and II. Alaska Department of Fish and Game, Anchorage, AK.

Hamilton, S.J. and R.H. Wiedmeyer. 1990. Concentrations of Boron, Molybdenum, and Selenium in Chinook Salmon. Transactions of the American Fisheries Society 19:500-510.

Hamilton, T.D. and G. Ashley. 1993. A Late Quaternary Environmental Record from Northwestern Alaska. *Geological Society of America Bulletin* 105:583-602.

Hammill, M.O. and T.G. Smith. 1991. The role of predation in the ecology of the ringed seal in Barrow Strait, Northwest Territories, Canada. Marine Mammal Science 7: 123-135.

Hannay, D.E., J. Delarue, B. Martin, X. Mouy, and J. Vallarta. 2011. Joint Studies 2009 Chukchi Acoustics Monitoring Program. Version 2.1. Technical report prepared by JASCO Applied Sciences for Olgoonik-Fairweather LLC.

Hannon, S.J., P.K. Eason, and K. Martin. 1998. Willow Ptarmigan (*Lagopus lagopus*). *In* The Birds of North America, No. 369 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Hansen, D.J. 1981. The Relative Sensitivity of Seabird Populations in Alaska to Oil Pollution. BLM-YK-ES-006-1792. U.S. Department of Interior, Bureau of Land Management, Anchorage, Alaska.

Harcharek, R.C. 1992. North Slope Borough 1992 Economic Profile. Volume VI. North Slope Borough Department of Planning and Community Services, Barrow, Alaska.

________. 1995. North Slope Borough 1993/94 Economic Profile and Census Report. Volume VII. North Slope Borough, Department of Planning and Community Services, Barrow, Alaska.

Harding, L.E. 1976. Den-site characteristics of Arctic coastal grizzly bears (*Ursus arctos*) on Richards Island, Northwest Territories, Canada. Canadian J. Zoology 54:1357-1363.

________ and J.A. Nagy. 1980. Responses of Grizzly Bears to Hydrocarbon Exploration on Richards Island, Northwest Territories, Canada. Pages 277-280 In Fourth International Conference Bears Resource and Management, Volume 4. Bears, their Biology and Management.

Harrington, B.A. 2001. Red Knot (*Calidris canutus*). *In* The Birds of North America, No. 563 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Harris, R.E., G.W. Miller, and W.J. Richardson. 2001. Seal Responses to Airgun Sounds During Summer Seismic Surveys in the Alaskan Beaufort Sea. Marine Mammals Science 17(4):795-812.

Hart Crowser Inc. 2000. Estimation of Oil Spill Risk from Alaska North Slope, Trans Alaska Pipeline and Arctic Canada Oil Spill Data Sets. Anchorage, AK: USDOI, MMS; 2000; OCS Study MMS 2000-007. 149 pp.

Harvey, B.C. and S.F. Railsback. 2011. Effects of Passage Barriers on Demographics and Stability Properties of a Virtual Trout Population. River Research and Applications. Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/rra.1574.

Harvey, C.J., B.J. Peterson, W.B. Bowden, A.E. Hershey, M.C. Miller, L.A. Deegan, and J.C. Finlay. 1998. Biological Responses to Fertilization of Oksrukuyik Creek, a Tundra Stream. Journal of the North American Benthological Society 17(2):190-209.

Harwood, L.A., S. Innes, P. Norton, and M.C.S. Kingsley. 1996. Distribution and abundance of beluga whales in the Mackenzie Estuary, southeast Beaufort Sea and west Amundsen Gulf during late July 1992. Can. J. Fish. Aquat. Sci. 53:2262-2273.

Hashagen, K.A., G. Green, and B. Adams. 2009. Observations of humpback whales, *Megaptera novaeangliae,* in the Beaufort Sea, Alaska. Northwestern Naturalist 90:160–162

Hastie G.D. and V.M. Janik. 2007. Behavioural responses of grey seals to multibeam imaging sonars. In: Abstr. 17th Bien. Conf. Biol. Mar. Mamm., 29 November–3 December, Cape Town, South Africa.

Hatch, J.J. 2002. Arctic Tern (*Sterna paradisaea*). *In* The Birds of North America, No. 707 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Haynes, G. 2002. *The Early Settlement of North America: The Clovis Era.* Cambridge, University Press.

Hazard, K.W. and L.F. Lowry. 1984. Benthic prey in a bowhead whale from the northern Bering Sea. Arctic 37 (2): 166-168.

Hazen, B. 1997. Use of Ice Roads and Ice Pads for Alaskan Arctic Oil Exploration Projects. In Proceedings: NPR – A Symposium: Science, Traditional Knowledge, and the Resources of the Northeast Planning Area of the National Petroleum Reserve in Alaska, April 16-18, 1997, Anchorage, Alaska. U.S. Department of Interior, Minerals Management Service, Alaska Outer Continental Shelf Region and Bureau of Land Management, Anchorage, Alaska.

Heard, D.C. and T.M. Williams. 1991. Wolf den distribution on migratory barren-ground caribou ranges in the Northwest Territories. Abstract. Proceedings of the Fourth North American Caribou Workshop, C. Butler and S.P. Mahoney, eds. St. John's, Newfoundland, Canada, 1991, pp. 249-250.

Hedman, W.H. 2010. The Raven Bluff Site: Preliminary Findings from a Late Pleistocene Site in the Alaskan Arctic. Paper presented at the 37th Annual Meeting of the Alaska Anthropological Association, Anchorage.

Heide-Jørgensen, M.P., S.E. Cosens, L.P. Dueck, K. Laidre, and L. Postma. 2008. Baffin Bay-Davis Strait and Hudson Bay-Foxe Basin bowhead whales: a reassessment of the two-stock hypothesis. Paper SC/60/BRG20 presented to the Scientific Committee of the International Whaling Commission. 36 pp.

________. 2009. Narwhal *Monodon monocerus*. Pages 754-758 *In*: W.F. Perrin, B. Würsig, and H.G.M. Thewissen (eds.), Encyclopedia of Marine Mammals 2nd ed. Academic Press, San Diego, CA. 1316 p.

Heinrich, A.C. 1963. Eskimo Type kinship and Eskimo Kinship. Unpublished Ph.D. Dissertation. University of Washington Microfilms. University of Michigan, Ann Arbor, Michigan.

Heman, M.L., R.S. Campbell, and L.C. Redmond. 1969. Manipulation of Fish Populations through Reservoir Drawdown. Transactions of the American Fisheries Society 98:293-304.

Hemming, C.R. 1988. Aquatic Habitat Evaluation of Flooded North Slope Gravel Mine Sites (1986-1987). Technical Report No. 88-1. Alaska Department of Fish and Game, Habitat Division, Juneau, AK.

________, P.K. Webber, and J.F. Winters. 1989. Limnological and Fisheries Investigations of Flooded North Slope Gravel Mine Sites, 1988. Technical Report No. 89-1. Alaska Department of Fish and Game, Habitat Division, Juneau, AK.

Hemming, J.E. 1971. The distribution movement patterns of caribou in Alaska. Technical Bulletin No. 1. Federal Aid in Wildlife Restoration Project W-17-R. Juneau, AK: State of Alaska, Dept. of Fish and Game.

Henley, W.F., M.A. Patterson, R.J. Neves, and A.D. Lemly. 2000. Effects of Sedimentation and Turbidity on Lotic Food Webs: a Concise Review for Natural Resource Managers. Reviews in Fisheries Science 8(2):125-139.

Hennessy T.W., T. Ritter, R.C. Holman, [and others]. 2008. The relationship between in-home water service and the risk of respiratory tract, skin and gastrointestinal tract infections among rural Alaska natives. Am J Public Health 98(11):2072-8.

Henshaw, J. 1968. The activities of the wintering caribou in northwestern Alaska in relation to weather and snow conditions. International Journal of Biometeorology 12:18-24.

Hepa, R.T., H.K. Brower, and D. Bates. 1997. North Slope Borough Subsistence Harvest Documentation Project: Data for Atqasuk, Alaska for the Period July 1, 1994 to June 30, 1995. North Slope Borough Department of Wildlife Management, Barrow, Alaska.

Herlugson, C.J., J.D. McKendrick, and J.A. Parnell. 1996. Gravel Pad Restoration on Alaska's North Slope. Pages 51-56 *In* International Conference on Health, Safety, and Environment, June 9-12, 1996, New Orleans, Louisiana. Society of Petroleum Engineers.

Herman-Stahl, M., D.L. Spencer, and J.E. Duncan. 2002. The implications of cultural orientation for substance use among American Indians. AI & Alaskan Native Mental Health Research 11: 46-66.

Hernandez, H. 1973. Natural Plant Recolonization of Surficial Distrubances, Tukoyaktuk Peninsula Region, Northwest Territories. Canadian Journal of Botany 51:2177-2196.

Hershey, A.E., W.B. Bowden, L.A. Deegan, [and others]. 1995. The Kuparuk River: A Long-term Study of Biological and Chemical Processes in an Arctic River. *In* Freshwater of Alaska: Ecological Synthesis, A.M. Milner and M.W. Oswood (eds.). Springer-Verlag, New York, New York.

Hess, B. 2010. Uncles Teach their Nephews to Hunt. Uiñiq Winter/Spring 2010.

Hicklin, P. and C.L. Gratto-Trevor. 2010. Semipalmated Sandpiper (*Calidris pusilla*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/006 doi:10.2173/bna.6

Higgins, C.L. and G.R. Wilde. 2005. The Role of Salinity in Structuring Fish Assemblages in a Prairie Stream System. Hydrobiologia 549:197-203.

Hill, E.L. 1984. Behavior Reaction of Caribou to the Upper Salmon Hydroelectric Development in Newfoundland. Page 7 In Second North American Caribou Workshop, October 17-20, 1984, Montreal, Quebec, T. Meredith (ed.). McGill University, Montreal, Quebec.

Hilton, K., D. Reichardt, H. Toniolo, and M. Lilly. 2009. Summary of Lake Chemistry and Physical Data for Selected North Slope, Alaska, Lakes: 2006-2009. Cooperative Arctic Lakes Data Collection Network, Alaska, Report No. INE/WERC 10.003.

Hinkel, K., B. Jones, W. Eisner, C. Cuomo, R. Beck, and R. Frohn. 2007. Methods to Assess Natural and Anthropogenic Thaw Lake Drainage on the Western Arctic Coastal Plain of Northern Alaska. Journal of Geophysical Research 112(F02S16):1-9.

Hinkes, M.T., G.H. Collins, L.J. Van Daele, S.D. Kovach, A.R. Aderman, J.D. Woolington and R.J. Seavoy. 2005. Influence of population growth on caribou herd identity, calving ground fidelity, and behavior. J. Wildl. Manage. 69:1147-1162.

Hinzman, L.D., D.L. Kane, and K.R. Everett. 1993. Hillslope Hydrology in an Arctic Setting. *In* Proceedings of the Sixth International Conference on Permafrost, Beijing, China.

________, T. Chapin, D. Sandberg, M. Fukuda, K. Yoshikawa, W.R. Bolton, K.C. Petrone, and S.E. Mitchell. 2000. Frostfire: Disturbance in an Alaska Boreal Forest. In: Frostfire Synthesis Workshop, Meeting Abstracts, compiled by L.D. Hinzman. http://www.uaf.edu/water/publications/ffabstrc.pdf

______, M.R. Lilly, D.L. Kane, D.D. Miller, B.K. Galloway, K.M. Hilton, and D.M. White. 2006. Physical and Chemical Implications of Mid-Winter Pumping of Tundra Lakes – North Slope, Alaska. December 2006, University of Alaska Fairbanks, Water and Environmental Research Center, Report INE/WERC 06.15, Fairbanks, Alaska.

Hirschberg, D. and S. Suzanne. 2005. Thirty Years Later: The Long-Term Effect of Boarding Schools on Alaska Natives and Their Communities. Institute of Social and Economic Research, University of Alaska Anchorage, Anchorage, Alaska.

Hobbie, J.E. 1982. Effects of Oil on Tundra Ponds and Streams. Final Report for Period October 1, 1978 to September 30, 1980. DOE/EV/02989-2. U.S. Department of Energy, Energy Research and Development Administration, Washington, DC.

________. 1984. The Ecology of Tundra Ponds of the Arctic Coastal Plain: a Community Profile. U.S. Fish and Wildlife Service Report FWS/OBS-83/25.

Hoffman, D., D. Libbey, and G. Spearman. 1988. Nuiqsut: Land Use Values Over Time in the Nuiqsut Area. . In North Slope Borough and the Anthropology and Historic Preservation Section of the Cooperative Park Studies Unit Occasional Paper No. 12 [ed.], University of Alaska, Fairbanks, Alaska.

Hohenberger, C.J., W.C. Hanson, and E.E. Burroughs. 1994. Birds of the Prudhoe Bay region, northern Alaska. Western Birds 25:73-103.

Hok, J.R. 1969. A Reconnaissance of Tractor Trails and Related Phenomena on the North Slope of Alaska. U.S. Bureau of Land Management, Washington, DC.

________. 1971. Some Effects of Vehicle Operation on Alaskan Arctic Tundra. M.S. Thesis, University of Alaska, Fairbanks.

Holden A.V. 1978. Pollutants and seals - a review. Mammal. Rev. 8:53-66.

Holder, K. and R. Montgomerie. 1993. Rock Ptarmigan (*Lagopus muta*). *In* The Birds of North America, No. 51 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Holland, K., D. Reichardt, C. Cormack, J. Derry, G. Myerchin, H. Toniolo, and M.R. Lilly. 2008. Snowmelt and Lake Recharge Monitoring for Selected North Slope, Alaska, Lakes: May/June 2008. University of Alaska Fairbanks, Water and Environmental Research Center, Report INE/WERC 08.13, Fairbanks, AK.

Holland, M.M., C.M. Bitz, and B. Tremblay. 2006. Future Abrupt Reductions in the Summer Arctic Sea Ice. Geophysical Research Letters, Vol. 33, L23503.

Holland, P. 1997. Offshore Blowouts Causes and Control. Houston, TX: Gulf Publishing Company.

Holman, R.C., A.T. Curns, S.F. Kaufman, J.E. Cheek, R.W. Pinner and L.B, Schonberger. 2001. Trends in infectious disease hospitalizations among American Indians and Alaska Natives. American Journal of Public Health 91(3): 425-431.

Holmes, C.E. and B.A. Crass. 2003. Early Cultural Components in Central Alaska: An Update from Swan Point. Paper presented at the 30th Annual Meeting of the Alaska Anthropological Association, Fairbanks

Holmes, R.T. and F.A. Pitelka. 1998. Pectoral Sandpiper (*Calidris melanotos*). *In* The Birds of North America, No. 348 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Hollis, A.L. 2008. Units 23 East, 24 West, and portions of Unit 26A Dall sheep. pp. 162-176 in P. Harper, editor. Dall sheep management report of survey and inventory activities 1 July 2004-30 June 2007. Alaska Department of Fish and Game. Project 6.0. Juneau, Alaska.

Holt M.M, V. Veirs, C.K. Emmons, and S. Veirs. 2008. Speaking up: Killer whales (*Orcinus orca*) increase their call amplitude in response to vessel noise. Acoustical Society of America, 125 (1): 27-32.

______, D.P. Noren, and C.K. Emmons. 2011. Effects of noise levels and call types on the source levels of killer whale calls. J. Acoust. Soc. Am. 130(5): 3100-3106.

Hone, E. 1934. The present status of the Muskox in Arctic North America and Greenland. American Committee for International Wildlife Protection, Publication No. 5.

Hoover-Miller, A.A., K.R. Parker, and J.J. Burns. 2001. A reassessment of the impact of the Exxon Valdez oil spill on harbor seals (Phoca vitulina) in Prince William Sound. Mar Mamm Sci. 17:111–135.

Hop, H. and A.J. Gharret. 1989. Genetic Relationships of Arctic Grayling in the Koyukuk and Tanana Rivers, Alaska. Transactions of the American Fisheries Society 118:290-295.

Hopkins, D.M. Jr., J.V. Mathews, C.E. Schweger, and S.B. Young, eds. 1982. *Paleoecology of Beringia.* New York, Academic Press.

Horejsi, B. 1981. Behavioral Response of Barren-Ground Caribou to a Moving Vehicle. Arctic 34(2):180-185.

Hose, J.E., M.D. McGurk, G.D. Marty, D.E. Hinton, E.D. Brown, and T.T. Baker. 1996. Sublethal Effects of the Exxon Valdez Oil Spill on Herring Embryos and Larvae: Morphological, Cytogenetic, and Histopathological Assessments, 1989-1991. Canadian Journal of Fisheries and Aquatic Sciences 53:2355-2365.

Houseknecht, D.W. and K.J. Bird. 2005. Oil and gas resources of the Arctic Alaska petroleum province. Studies by the Geological Survey in Alaska, U.S. Geological Survey Professional Paper 1732-A.

_______, K.J. Bird, J.H. Schuenemeyer, [and others]. 2010. 2010 Updated Assessment of Undiscovered Oil and Gas Resources of the National Petroleum Reserve in Alaska (NPR-A); U.S. Geological Survey Fact Sheet 2010–3102.

______, **W. Rouse, C. Garrity, [and others]. 2012.** Assessment of Potential Oil and Gas Resources in Source Rocks of the Alaska North Slope, 2012. U.S. Geological Survey Fact Sheet 2012-3013. Available at http://pubs.usgs.gov/fs/2012/3013/pdf/fs2012-3013.pdf.

Hu, F.S., P.E. Higuera, J.E. Walsh, W.L. Chapman, P.A. Duffy, L.B. Brubaker, and M.L. Chipman. 2010. Tundra burning in Alaska: Linkages to climatic change and sea ice retreat, J. Geophys. Res., 115, G04002, doi:10.1029/2009JG001270.

Hubbard, R.J., S.P. Edrich, and R.P. Rattey. 1987. Geological Evolution and Hydrocarbon Habitat of the "Arctic Alaska Microplate." Marine and Petroleum Geology 4:2-34.

Huckabay, A. and C.L. Hanks. 2009. "The Petroleum Geology of Umiat Oil Field, North Slope, Alaska." Proceedings of the 2009 AAPG 3PArctic Conference, Moscow, Russia.

Huey, L.M. 1952. An Alaskan Record of the Narwhal. J. Mammalogy 334:496.

Hull, C. (editor). 1994. Wildlife Notebook Series. Alaska Department of Fish and Game Juneau, Alaska.

Hultén, O.E.G. 1937. *Outline of the History of Arctic and Boreal Biota During the Quaternary Period*. PhD. Thesis, Lund University, Lund, Sweden.

Hundertmark, K.J., G.F. Shields, I.G. Udina, R.T. Bowyer, A.A Danilkin, and C.C. Schwartz. 2002. Mitochondrial Phylogeography of Moose (*Alces alces*): Late Pleistocene Divergence and Population Expansion. *Molecular Phylogenetic Evolution*, 22(3):375-87.

Hung , G.A. and G.L. Chmura. 2006. Mercury Accumulation in Surface Sediments of Salt Marshes of the Bay of Fundy. Environmental Pollution 142: 418-431. doi:10.1016/j.envpol.2005.10.044

Hunter, C.M., H. Caswell, M.C. Runge, E.V. Regehr, S.C. Amstrup, and I. Stirling. 2010. Climate change threatens polar bear populations: a stochastic demographic analysis. Ecology 91(10):2883-2897.

Huntington H.P. and the Communities of Buckland, Elim, Koyuk, Point Lay and Shaktoolik. 1999. Traditional Knowledge of the Ecology of Beluga Whales (*Delphinapterus leucas*) in the Eastern Chukchi and Northern Bering Seas, Alaska. Arctic 52 (1): 49-61.

Hurst, R.J. and N. Oristsland. 1982. Polar bear thermoregulation: effect of oil on the insulative properties of fur. J. Therm. Biology 7:201-208.

Idler, E.L. and Y. Benyamini. 1997. Self-Rated Health and Mortality: A Review of 27 Community Studies. J Health Soc Behav 38: 21-37.

Il'ichev, V.D. and V.E. Flint, eds. 1982. Birds of the USSR, history of research. Loons, grebes and tube-nosed swimmers. Nauka Publishers, Moscow, USSR. 446 pp.

Immediate Action Work Group (IAWG). 2009. Recommendations to the Governor's Subcabinet on Climate Change.

Impact Assessment Inc. (IAI). 1990. Subsistence Resource Harvest Patterns: Nuiqsut. Special Report No. 8. Prepared for the U.S. Department of Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

________. **1990a.** Subsistence Resource Harvest Patterns: Nuiqsut. Special Report No. 8. Prepared for the U.S. Department of Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

________. **1990b.** Subsistence Resource Harvest Patterns: Kaktovik. Outer Continental Shelf Study, MMS 90-0039. Special Report 9. Prepared for the U.S. Department of Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

Indian Health Service (IHS). 1999. An Oral Health Survey of American Indian and Alaska Native Dental Patients: Findings, Regional Differences, and National Comparisons. Division of Oral Health, Department of Oral Health, Indian Health Service, Rockville, MD.

Institute for Social and Economic Research (ISER). 1983. A Description of the Socioeconomics of the North Slope Borough. Technical Report No. 85 and 85a. Prepared by J.A. Kruse, M. Baring-Gould, W. Schneider, J. Gross, G. Knapp, and G. Sherrod for U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

Interagency Monitoring of Protected Visual Environments (IMPROVE). 2010. Data available online at: http://vista.cira.colostate.edu/views/

Intergovernmental Panel on Climate Change (IPCC). 2001. Third Assessment Report: Climate Change 2001. Cambridge University Press, Cambridge, United Kingdom, and New York, New York.

________. **2001a.** Note from the United Nations Climate Change 2001 Report.

________. **2007a.** Climate Change 2007: The Physical Basis (Summary for Policymakers). Cambridge University Press, Cambridge, United Kingdom, and New York, New York. Available online at: http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg1_report_the_physical_science_basis.htm

________. **2007b.** Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

International Whaling Commission. 2011. Report of the Scientific Committee, Tromsoe, Norway. 9. Aboriginal Subsistence Whaling Management Advice. IWC/SC 63 Rep.1.

Inuit Tapirisat of Canada. 2000. We are the Inuit (brochure). Ottawa: Inuit Tapirisat of Canada.

Ireland, D.S., W.R. Koski, T. Thomas, M. Jankowski, D. W. Funk, and A. M. Macrander. 2008. Distribution and abundance of cetaceans in the Eastern Chukchi Sea in 2006 and 2007. Paper SC/60/BRG27 presented to the International Whaling Commission (IWC), Santiago, Chile, June 2008. 11 pp.

________**, D.W. Funk. R. Rodrigues, and W.R. Koski (eds.). 2008.** Joint Monitoring Program in the Chukchi and Beaufort seas, July-November 2007. LGL Alaska Report P971-1, Report from LGL Alaska Research Associates, Inc., LGL Ltd., JASCO Research , Ltd., and Greeneridge Sciences, Inc. for Shell Offshore, Inc. ConocoPhillips Alaska, Inc., and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 445 p. plus Appendices. Moore, S. E., K. M. Stafford, D. K. Mellinger, and J. A. Hildebrand. 2006. Listening for large whales in the offshore waters of Alaska. Ecological Applications 16:932–944.

Irving, L. 1960. Birds of Anaktuvuk Pass, Kobuk, and Old Crow. United States National Museum Bulletin 217. Smithsonian Institution Washington, D.C.

________ **and S. Paneak. 1954**. Biological Reconnaissance Along the Ahlasuruk River east of Howard Pass, Brooks Range, Alaska, with notes on the avifauna. Journal of the Washington Academy of Sciences Vol. 44 No. 7 pages 201-211.

Irving, W.N. 1962. A Provisional Comparison of Some Alaskan and Asian Stone Industries. In *Prehistoric Cultural Relations between the Arctic and Temperate Zones of North America,* edited by J. M. Campbell, pp. 55-68. Arctic Institute of North America, Technical Paper No. 11.

________**. 1964.** Punyik Point and the Arctic Small Tool Tradition. Ph.D. dissertation, Department of Anthropology, University of Wisconsin, Madison.

Isleib M.E. and B. Kessel. 1973. Birds of the North-Gulf Coast Prince William Sound Region, Alaska. Biological Papers of the University of Alaska 14:1-149.

________**. 1979.** Migratory shorebird populations on the Copper River Delta and Eastern Prince William Sound, Alaska. Studies in Avian Biol. 2:125-129.

Itta, N. 2001. Public Testimony. Draft Environmental Impact Statement for Liberty Development and Production Plan, Outer Continental Shelf EIS/EA MMS 2001-001, March 19, 2011, Nuiqsut, Alaska. U.S. Department of the Interior, Minerals Management Service, Anchorage, Alaska.

Ivie, P. and W. Schneider. 1979. Wainwright Synopsis. Pages 75-87. In: Native Livelihood and Dependence: A Study of Land Use Values Through Time. U.S. Department of the Interior, National Petroleum Reserve in Alaska, 105(C) Field Study No. 1.

Izon, D., E.P.Danenberger and M. Mayes. 2007. Absence of fatalities in blowouts encouraging in MMS study of OCS incidents 1992-2006. Drilling Contractor:84-89.

Jackson, H.R. and K. Gunnarsson. 1990. Reconstructions of the Arctic: Mesozoic to Present. Tectophysics 172:303-322.

Jakimchuk, R.D., S.H. Ferguson, and L.G. Sopuck. 1987. Differential habitat use and sexual segregation in the Central Arctic Caribou Herd. Canadian Journal of Zoology 65:534-541.

Jamison, H.C., L.D. Brockett, and R.A. McIntosh. 1980. Prudhoe Bay- A 10 Year Persepective. Giant Oil and Gas Fields of the Decade 1968-1978, M.T. Halbouty (ed.). American Association of Petroleum Geologists, Tulsa, Oklahoma.

Jandt, R.R., C.R. Meyers, and M.J. Cole. 2003. Western Arctic Caribou Herd winter habitat monitoring and utilization, 1995-1996. BLM-Alaska Open File Report 88. BLM/AK/ST-003/006+6710+020. U.S. Dept. of the Interior, Bureau of Land Management, Anchorage, Alaska. 26 pp.

________, K. Joly, C.R. Meyers, and C. Racine. 2008. Slow recovery of lichen on burned caribou winter range in Alaska tundra: potential influences of climate warming and other disturbance factors. Arctic, Antarctic and Alpine Research. 40:89-95.

Jankowski, M., H. Patterson, and D. Savarese. 2009. Beaufort sea vessel-based monitoring program. (Chapter 6) *In:* Ireland, D.S., D.W. Funk, R. Rodrigues, and W.R. Koski (eds.). Joint monitoring program in the Chukchi and Beaufort seas, open water seasons, 2006–2007. LGL Alaska Report P971-2. Report from LGL Alaska Research Associates, Inc., Anchorage, AK, LGL Ltd., environmental research associates, King City, Ont., JASCO Research Ltd., Victoria, B.C., and Greeneridge Sciences, Inc., Santa Barbara, CA, for Shell Offshore, Inc., Anchorage AK, ConocoPhillips Alaska, Inc., Anchorage, AK, and the National Marine Fisheries Service, Silver Springs, MD, and the U.S. Fish and Wildlife Service, Anchorage, AK. 485 p. plus Appendices.

Jansen, J.K., P.L. Boveng, S.P. Dahle, and J.L. Bengtson. 2010. Reaction of harbor seals to cruise ships. Journal of Wildlife Management 74:1186-1194

Jay, C.V., S.D. Farley, and G.W. Garner. 2001. Summer diving behavior of male walruses in Bristol Bay, Alaska. Marine Mammal Science 17(3): 617-631.

________ and S. Hills. 2005. Movements of walruses radio-tagged in Bristol Bay, Alaska. Arctic 58:192-202.

________, B.G. Marcot, and D.C. Douglas. 2011. Projected Status of the Pacific Walrus (*Odobenus rosmarus divergens*) in the twenty-first century. Polar Biology 34:1065-1084.

Jennings, L. 1994. Red fox. Internet Wildlife Notebook Series Home Page. Juneau, AK: State of Alaska, Dept. of Fish and Game.

Jensen, H.K.B., S. Boitsov, T.E. Finne, J. Klungsøyr, and J. Knies. 2009. Physical and chemical traces of anthropogenic influence at the seabed and in the sediments in Ingøydjupet, Southern Barents Sea. Norwegian Journal of Geology 89:101-108.

Jensen, K.C. 1990. Responses of molting Pacific black brant to experimental aircraft disturbance in the Teshekpuk Lake Special Area, Alaska. Dissertation, Texas A&M University, College Station Texas

Jensen, P.G and L.E. Noel. 2002. Caribou distribution in the Northeast National Petroleum Reserve – Alaska, summer 2001. Chapter 3 In Arctic coastal plain caribou distribution, summer 2001, M.A. Cronin (ed.). Unpublished report prepared by LGL Alaska Research Associates, Inc., for British Petroleum Exploration – Alaska, Inc., Anchorage, Alaska.

Jenssen B.M. 1996. An overview of exposure to, and effects of, petroleum oil and organochlorine pollution in grey seals (*Halichoerus grypus*). Science of the Total Environment 186:109-118.

Jewett, S.C., T.A. Dean, B.R. Woodin, M.K. Hoberg, and J.J. Stegeman. 2000. Exposure to Hydrocarbons Ten Years after the Exxon Valdez Oil Spill: Evidence from Cytochrome P4501A Expression and Biliary FACs in Nearshore Demersal Fishes. Restoration Project 99379. Report for Alaska Department of Fish and Game, Habitat and Restoration Division, Anchorage, AK.

Jia, Y., Q. Liu, C.A. Goudie, and B.A. Simco. 2009. Survival, Growth, and Feed Utilization of Pre- and Postmetamorphic American Shad Exposed to Increasing Salinity. North American Journal of Aquaculture 71(3):197-205.

Jingfors, K.T. 1982. Seasonal Activity Budgets and Movements of a Reintroduced Alaskan Muskox Herd. Journal Wildlife Management 46(2):344-350.

_______ and D.R. Klein. 1982. Productivity in recently established muskox populations in Alaska. J. Wildl. Manage. 46:1092-1096.

Johnsgard, P.A. 1990. Hawks, eagles, and falcons of North America: biology and natural history. Smithsonian Institution Press, Washington, D.C.

Johnson, C.B., R.M. Burgess, B.E. Lawhead, J.R. Rose, M.T. Jorgenson, and A.A. Stickney. 1996. Wildlife studies on the Colville River Delta, 1995. Fourth annual report. ARCO Alaska, Inc., and the Kuparuk Unit Owners, Anchorage, Alaska.

_______, R.M. Burgess, B.E. Lawhead, J. Neville, J.P. Parrett, A.K. Prichard, J. R. Rose, A. A. Stickney, and A. M Wildman. 2003. Alpine avian monitoring program, 2001. Fourth annual and synthesis report for ConocoPhillips Alaska, Inc., and Anadarko Petroleum Corporation, Anchorage, by ABR, Inc., Fairbanks, AK. 194 pp.

_______, R.M. Burgess, A.M. Wildman, A.A. Stickney, P.E. Seiser, B.E. Lawhead, T.J Mabee, A.K. Prichard, and J.R. Rose. 2005. Wildlife studies for the Alpine Satellite Development Project, 2004. Second annual report for ConocoPhillips Alaska, Inc., and Anadarko Petroleum Corporation, Anchorage, by ABR, Inc., Fairbanks, AK. 129 pp.

_______, J.P. Parrett, and P.E. Seiser. 2006. Spectacled Eider monitoring at the CD-3 development, 2005. Annual report for ConocoPhillips Alaska, Inc., and Anadarko Petroleum Corporation, Anchorage, by ABR, Inc., Fairbanks, AK.

________, A.M. Wildman, J.P. Parrett, J.R. Rose, and T. Obritschkewitsch. 2007. Avian studies for the Alpine Satellite Development Project, 2006. Fourth annual report for ConocoPhillips Alaska, Inc., and Anadarko Petroleum Corporation, Anchorage, by ABR, Inc., Fairbanks, AK. 31 pp.

________, J.P. Parrett, and P.E. Seiser. 2008. Spectacled Eider monitoring at the CD-3 development, 2007. Annual report for ConocoPhillips Alaska, Inc., and Anadarko Petroleum Corporation, Anchorage, by ABR, Inc., Fairbanks, AK.

________, A.M. Wildman, J.P. Parrett, J.R. Rose, T. Obritschkewitsch, and A. A. Stickney. 2009. Avian studies for the Alpine Satellite Development Project, 2008. Sixth annual report for ConocoPhillips Alaska, Inc., and Anadarko Petroleum Corporation, Anchorage, by ABR, Inc., Fairbanks, AK.

________, A.M. Wildman, J.P. Parrett, J.R. Rose, and T. Obritschkewitsch. 2010. Avian studies for the Alpine Satellite Development Project, 2009. Seventh annual report for ConocoPhillips Alaska, Inc., and Anadarko Petroleum Corporation, Anchorage, by ABR, Inc., Fairbanks, AK. 83 pp

Johnson, C.C. and Malhotra. 1994. BLM report: Preliminary Assessment Driftwood Drums Site.

Johnson, D.R. and M.C. Todd. 1977. Summer Use of a Highway Crossing by Mountain Caribou. The Canadian Field-Naturalist 91(3):312-314.

________ and S.R. Herter. 1989. The Birds of the Beaufort Sea. British Petroleum Exploration of America, Anchorage, Alaska.

________ and B.E. Lawhead. 1989. Distribution, Movements and Behavior of Caribou in the Kuparuk Oil Field, Summer 1988. Unpublished Report. ARCO Alaska, Inc., Anchorage, Alaska.

Johnson, J.A., R.B. Lanctot, B.A. Andres, J.R. Bart, S.C. Brown, S.J. Kendall, and D.C. Payre. 2007. Distribution of Breeding Shorebirds on the Arctic Coastal Plain of Alaska. Arctic 60(3):277-293.

Johnson, O.W. 2003. Pacific and American golden-plovers: reflections on conservation needs. Wader Study Group Bull 100:10–13.

________ and P.G. Connors. 2010. American Golden-Plover (*Pluvialis dominica*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/201 doi:10.2173/bna.201

Johnson, P.R. and S.M. Collins. 1980. Snow Pads Used for Pipeline Construction in Alaska, 1976: Construction, Use and Breakup. Cold Regions Research and Engineering Laboratory Report 80-17. Prepared for Directorate of Military Programs, Office of the Chief of Engineers, by U.S. Army, Corps of Engineers, Cold Regions Research and Engineering Laboratory.

Johnson, S.R. 1984. Habitat Use and Behavior of Nesting Common Eiders and Molting Oldsquaws at Thetis Island, Alaska, During a Period of Industrial Activity. Report Prepared by LGL Alaska Research Associates, Inc., for SOHIO Alaska Petroleum Company, Anchorage, Alaska.

________. **1993.** An important early-autumn staging area for Pacific flyway brant: Kasegaluk Lagoon, Chukchi Sea, Alaska. J. Field Ornithol 64(4):539-548.

________. **2000.** Lesser Snow Goose. In The Natural History of an Arctic Oil Field: Development and the Biota, J.C. Truett and S.R. Johnson (eds.). Academic Press, New York, New York.

Johnson, S.W., J.F. Thedinga, A.D. Neff, and C.A. Hoffman. 2010. Fish Fauna in Nearshore Waters of a Barrier Island in the Western Beaufort Sea, Alaska. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center. NOAA Technical Memorandum NMFS-AFSC-210.

Joesting, H.R. and N. Ebbley, Jr. 1943. Report of Investigation of Petroleum Seepages, Arctic Slope Area, Alaska. U.S. Bureau of Mines and the Alaska Territorial Department of Mines, Washington, D.C. and Juneau, Alaska. [Edition published on Alaska DGGS website as MR 195-27.pdf with additional material.]

Joly, K., R.R. Jandt, C.R. Meyers, and M.J. Cole. 2006. Changes in vegetative cover on Western Arctic Herd winter range from 1981-2005: potential effects of grazing and climate change. Abstract. 11th North American Caribou Conference. Jasper, Alberta, Canada. April 23-27, 2006.

________ **and R.R. Jandt. 2007.** The unidirectional influences of wildfire, disturbance by caribou, global climate change and shrub expansion on arctic ecosystems. pp. 217-220 in Seventh International Conference on Global Change: Connection to the Arctic (GCCA-7). International Arctic Research Center, University of Alaska, Fairbanks.

Jones, B.M., C.D. Arp, M.T. Jorgenson, K.M. Hinkel, J.A. Schmutz, and P.L. Flint. 2009a. Increase in the rate and uniformity of coastline erosion in Arctic Alaska. Geophysical Research Letters, 36(3), 1-5. American Geophysical Union. Retrieved from http://www.agu.org/pubs/crossref/2009/2008GL036205.shtml

________**, C.D. Arp, K.M. Hinkel, R.A. Beck, J.A. Schmutz, and B. Winston. 2009b.** Arctic Lake Physical Processes and Regimes with Implications for Winter Water Availability and Management in the National Petroleum Reserve Alaska. Environmental Management 43:1071-1084.

Jones M.L. and S.L. Swartz. 2009. Gray whale *Eschrichtius robustus*. In: Perrin WF, Würsig B, Thewissen HGM (eds.), Encyclopedia of Marine Mammals 2nd ed., Academic Press, San Diego, CA. 1316 p.

Jonsgard, A. 1966. Biology of the North Atlantic fin whale, *Balaenoptera physalus* (*L.*). Taxonomy, distribution, migration and food. Hvalradets Skrifter 49: 1-62.

Jorgenson, J.C., P.E. Joria, T.R. McCabe, [and others]. 1994. User's Guide for the Land-Cover Map of the Coastal Plain of the Arctic National Wildlife Refuge. Anchorage, AK: USDOI, FWS, 46 pp.

________, **B.E. Reitz, and M.K. Raynolds. 1996.** Tundra Disturbance and Recovery Nine Years after Winter Seismic Exploration in Northern Alaska. Unpublished Report. U.S. Department of Interior, U.S. Fish and Wildlife Service, Fairbanks, Alaska.

________ **and C.A. Buchholtz. 2003.** Eighteen years of vegetation monitoring in the Arctic National Wildlife Refuge, Alaska. http://www.arcus.org/SEARCH/meetings/2003/webcast.php.

________, **J.M. Ver Hoef, and M.T. Jorgenson. 2010.** Long-term recovery patterns of arctic tundra after winter seismic exploration. Ecological Applications 20: 205-221.

Jørgensen M.E., P. Bjeregaard, K. Borch-Johnsen, V. Backer, U. Becker, T. Jørgensen, and G. Mulvad. 2002. Diabetes and Impaired Glucose Tolerance Among the Inuit Population of Greenland. Diabetes Care 25(10): 1766-1771.

Jorgenson, M.T. 1997. Effects of Petroleum Spills on Tundra Ecosystems. In Proceedings: Science, Traditional Knowledge, and the Resources of the Northeast Planning Area of the National Petroleum Reserve in Alaska, April 16-18, 1997, Anchorage, Alaska. Outer Continental Shelf Report MMS 97-0013. U.S. Department of Interior, Mineral Management Service, and Bureau of Land Management, Anchorage, Alaska.

________. **1999.** Assessment of tundra damage along the ice road to the Meltwater South exploratory well site. Unpubl. rept. prepared for ARCO Alaska, Inc., Anchorage, AK, by ABR, Inc., Fairbanks, AK. 11 pp.

________, **J. Kidd, and T. Cater. 1992.** Rehabilitation of a Thick Gravel Pad Using Snow Capture and Topsoil Addition, Drill Site 13, Prudhoe Bay Oil Field, Alaska, 1992. First Annual Report. Prepared by Alaska Biological Research, Inc., Fairbanks, Alaska. 19 pages.

________, **and M.R. Joyce. 1994.** Six Strategies for Rehabilitating Land Disturbed by Oil Development in Arctic Alaska. Arctic 47(4):374-390.

________ **and E.R. Pullman. 2002.** Geomorphology of the Northeast Planning Area of the National Petroleum Reserve – Alaska, 2001. First Annual Report. Prepared by ABR, Inc., for Phillips Alaska, Inc., Fairbanks, Alaska.

________, **J.E. Roth, M. Emers, S. Schlentner, and J. Mitchell. 2003.** Assessment of Ecological Impacts Associated with Seismic Exploration Near the Colville Delta. Alaska Conference on Reducing the Effects of Oil and Gas Exploration and Production on Alaska's North Slope: Issues, Practices, and Technologies. National Engineering and Environmental Lab, Department of Energy, Boise, Idaho.

________ **and J. Brown. 2005.** Classification of the Alaskan Beaufort Sea coast and estimation of carbon and sediment inputs from coastal erosion. Geo-Mar Lett 25:69-80

Joshi, D.R. 1991. Horizontal Well Technology, Penwell Publishing Company, Tulsa, Oklahoma.

Joyce, A. 2008. Risk and Opportunity in British Columbia Shellfisheries: The Role of Limited Property Rights in Aquaculture Development. University of British Columbia, Vancouver, British Columbia.

Joyce, M.R., L.A. Rundquist, L.L. Moulton, R.W. Firth, and E.H. Follman. 1980. Gravel Removal Guidelines Manual for Arctic and Subarctic Floodplains. FWS/OBS-80/09. U.S. Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C.

Kachadoorian, R. and F.E. Crory. 1988. Engineering Geology Studies in the National Petroleum Reserve in Alaska. In Geology and Exploration of the National Petroleum Reserve in Alaska, 1974 to 1982, G. Gryc (ed.). U.S. Geological Survey Professional Paper 1399.

Kahn, R.A. 1990. Parasitism in Marine Fish after Chronic Exposure to Petroleum Hydrocarbons in the Laboratory and to the Exxon Valdez Oil Spill. Bulletin of Environmental Contamination and Toxicology 44:759-763.

________ **and J.W. Kiceniuk. 1988.** Effect of Petroleum Aromatic Hydrocarbons on Monogeneids Parasitizing Atlantic Cod, *Gadus morhua L.* Bulletin of Environmental Contamination and Toxicology 41:94-100.

Kalxdorff, S. and K. Proffitt. 2003. Demography and Behavior of Polar Bears Feeding on Stranded Mammal Carcasses. In Presentation Summaries of the U.S. Department of the Interior, Minerals Management Service Information Transfer Meeting, March 10-12, 2003, Anchorage, Alaska.

Kanehl, P. and J. Lyons. 1992. Impacts of In-stream Sand and Gravel Mining on Stream Habitat and Fish Communities, Including a Survey on the Big Rib River, Marathon County, Wisconsin. Wisconsin Department of Natural Resources, Research Report 155.

Kassam, K.A. and Wainwright Traditional Council. 2001. Passing on the Knowledge: Mapping Human Ecology in Wainwright, Alaska. The Arctic Institute of North America of the University of Calgary, Calgary, Alberta, Canada.

Kavry, V.I., A.N. Boltunov, and V.V. Nikiforov. 2008. New coastal haulouts of walruses (*Odobenus rosmarus*) – response to the climate changes: in Collection of Scientific Papers from the Marine Mammals of the Holarctic V conference, Odessa, Ukraine, October 14-18, 2008, p 248-252.

Kawaguchi, S., H. Kurihara, R. King, L. Hale, T. Berli, J.P. Robinson, A. Ishida, M. Wakita, P. Virtue, S. Nicol, and A. Ishimatsu. 2011. Will krill fare well under Southern Ocean acidification? Biol. Lett. 7: 288-291.

Kawamura A. 1982. Food habits and prey distributions of three rorqual species in the North Pacific Ocean. Sci Rep Whales Res Inst 34:59–91.

Keevil, B.E. and R. Ramseier. 1975. Behavior of Oil Spilled Under Floating Ice. Pages 497-501 In 1975 Conference on Prevention and Control of Oil Pollution. American Petroleum Institute.

Kelly, B.P. 1988. Ribbon seal *Phoca fasciata*. Pages 95-106 in JW Lentfer, ed. Selected marine mammals of Alaska: Species accounts with research and management recommendations Marine mammal commission, Wash DC.

________. **1988a.** Ringed seal *Phoca hispida. In*: Lentfer JW (ed) Selected marine mammals of Alaska: species accounts with research and management recommendations. U.S. Marine Mammal Commission, Washington, Pp. 57–75.

________. **1988b.** Bearded Seal *Erignathus barbatus In*: Lentfer JW (ed) Selected marine mammals of Alaska: species accounts with research and management recommendations. U.S. Marine Mammal Commission, Washington, Pp. 76-94.

________, **P. Boveng, and B.R. Swanson. 2008.** Ice seal movements and stock structure in a changing cryosphere. NPRB Project 515 Final Report.

________, **Burns, L.L. and Quakenbush, L.T. 1988.** Response of ringed seals (*Phoca hispida*) to noise disturbance. p. 27-38 In: Sackinger, W.M., Jeffries, M.O., Imm, I.L. and Treacy S.D. (eds.) Port and Ocean Engineering under Arctic Conditions, Vol. II; Symposium on Noise and Marine Mammals. Geophysical Inst. Univ. AK, Fairbanks. 111 p.

________. **2009.** Studying seal in their sea ice habitat: application of traditional and scientific methods. Pages 301-344 in H. Eicken, R. Gradinger, M. Salganek, K. Shirasawa, D. Perovich, M. Leppäranta, eds. Field techniques for sea ice research. University of Alaska Fairbanks, Fairbanks.

________, **Bengtson, J.L., Boveng, P.L., Cameron, M.F., [and others]. 2010.** Status Review of the Ringed Seal (*Phoca hispida*) NOAA Technical Memorandum NMFS-AFSC-212.

Kelley, K.D. and C.D. Taylor. 1995. Natural environmental effects associated with the Drenchwater zinc-lead-silver massive sulfide deposit with comparisons to the Lik and Red Dog deposits, Brooks Range, Alaska, *in* Dumoulin, J.A., and Moore, T.E., eds., Geologic studies in Alaska by the U.S. Geological Survey, 1994: U.S. Geological Survey Bulletin 2152, pp. 31-45.

________ **and C.D. Taylor. 1997.** Environmental geochemistry of shale-hosted Ag-Pb-Zn massive sulfide deposits in northwest Alaska: natural background concentrations of metals in water from mineralized areas Applied Geochemistry, Volume 12, Number 4, July 1997, pp. 397-409(13)

Kelley, J.S., I.L. Tailleur, R.L. Morin, [and others]. 1993. Barite deposits in the Howard Pass Quadrangle and possible relations to barite elsewhere in the northwestern Brooks Range, Alaska: U.S. Geological Survey Open-File Report 93-215, 13 p.

Kelleyhouse, R.A. 2001. Calving ground selection and fidelity: Teshekpuk Lake and Western Arctic caribou herds. M.S. Thesis. University of Alaska, Fairbanks. xvii+124 pp.

Kempka, R.G., R.D. MacLeod, F.A. Reid, J. Payne, D.A. Yokel, and G. Balogh. 1995. National Petroleum Reserve; Alaska Landcover Inventory: Exploring Arctic Coastal Plain Using Remote Sensing. In Ninth Symposium on Geographic Information Systems, Vancouver, British Columbia, August 1995. GIS World, Inc., Vancouver, British Columbia.

Kendall, S.J. and B.A. Agler. 1998. Distribution and abundance of Kittlitz's murrelets in southcentral and southeastern Alaska. Colonial Waterbirds 21(1):53-60.

Kertell, K. 1993. Macroinvertebrate Production and Waterbird Use of Natural Ponds and Impoundments in the Prudhoe Bay Oil Field, Alaska. Report Prepared by LGL Alaska Research Associates, Inc., Anchorage, Alaska, for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

________**. 1994.** Water Quality and Pacific Loon Breeding Biology on Natural Ponds and Impoundments in the Prudhoe Bay Oil Field, Alaska. Report Prepared by LGL Alaska Research Associates, Inc., Anchorage, Alaska, for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

________**. 2000.** Pacific Loon. Pages 181-195 *In* The Natural History of an Arctic Oil Field: Development and the Bota, J.C. Truett and S.R. Johnson (eds.). Academic Press, San Diego, California.

Kessel, B. and T.J. Cade. 1956. Habitat Preferences of the Birds of the Colville River. In: Science in Alaska 1953. Proceedings of the Fourth Alaskan Science Conference, Alaska Division, American Association for the Advancement of Science, Juneau, Alaska, September 28 – October 3, 1953. College, Alaska: University of Alaska, pp. 179-181.

________ **and T.J. Cade. 1958.** Birds of the Colville River, Northern Alaska, F. Dean (ed.). Biological Papers of the University of Alaska Number 2. College, Alaska: University of Alaska.

________ **and D.D. Gibson. 1978.** Status and Distribution of Alaska Birds. Studies in Avian Biology No. 1. Allen Press, Inc., Lawrence, Kansas 66044.

________**. 1989.** Birds of the Seward Peninsula, Alaska: their biogeography, seasonality, and natural history. Univ. of Alaska Press, Fairbanks, Alaska. 330 pp.

Ketten, D.R. 1995. Estimates of blast injury and acoustic trauma zones for marine mammals from underwater explosions. Sensory Systems of Aquatic Mammals 391-407.

________**, J. Lien, and S. Todd. 1993.** Blast injury in humpback whale ears: Evidence and implications. J. Acoust. Soc. Am. 94(3):1849-1850.

Kevan, P.G., B.C. Forbes, S.M. Kevan, and V. Behan-Pelletier. 1995. Vehicle Tracks on High Arctic Tundra: Their Effects on the Soil, Vegetation, and Soil Arthropods. Journal of Applied Ecology 32:655-667.

Kharaka, Y.K. and W.W. Carothers. 1988. Geochemistry of Oil-Field Water from the North Slope. *In* Geology and Exploration of the National Petroleum Reserve in Alaska, 1974 to 1982, G. Gryc (ed.). U.S. Geological Survey Paper 1399. U.S. Geological Survey, Washington, D.C.

Kidd, Janet G., Bill Streever, Michael R. Joyce and Lloyd H. Fanter. 2004. "Wetland Restoration of an Exploratory Well on Alaska's North Slope: A Learning Experience." Ecological Restoration 22:1 and 22:30-38, March 2004.

King, J.E. 1983. Seals of the world 2nd ed. British Museum of Natural History. London. Pp. 240.

King, R. 1979. Results of aerial surveys of migratory birds on NPR-A in 1977 and 1978. pp. 187 - 226 in P. C. Lent (ed.). Studies of selected wildlife and fish and their use of habitats on and adjacent to NPR-A, 1977-1978. Vol. 1. NPR-A Work Group 3, Anchorage, AK.

Kingsley, M.C.S. 1986. Distribution and abundance of seals in the Beaufort Sea Amundsen Gulf and Prince Albert Sound, 1984. Environmental Studies Resolving Funds Report No. 025. Ottawa, Ont.

Kirschner, C.E. and B. Rycerski. 1988. Petroleum Potential of Representative Stratigraphic and Structural Elements in the National Petroleum Reserve in Alaska, 1974-1982, G. Gryc (ed.). U.S. Geological Survey Professional Paper 1399. U.S. Geological Survey, Anchorage, Alaska.

Kissling M., K.J. Kuletz, and S. Brockmann. 2005. Distribution and abundance of Brachyramphus murrelets from Icy Bay to Cross Sound and in selected mainland fjords of Southeast Alaska. Unpublished report, U.S. Fish and Wildlife Service, Juneau, AK.

________**, S. Gende, M. Reid, S.B. Lewis, P. Lukacs, and N. Hatch. 2007.** Identifying nesting and foraging habitat of Kittlitz's murrelets (*Brachyramphus brevirostris*) in Icy Bay, Alaska; 2007 annual summary. Unpublished report, U.S. Fish and Wildlife Service, Juneau, Alaska.

Klein, D.R. 1992. Comparative ecological and behavioral adaptations of *Ovibos moschatus* and *Rangifer tarandus*. Rangifer 12:47-55.

________**. 1995.** Tundra or Arctic hares. In Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. E.T. LaRoe, G.S. Farris, C.E. Puckett, P.D. Doran, and M.J. Mac (eds.), U.S. Department of the Interior, National Biological Service, Washington, D.C.

________**. 1999.** The roles of climate and insularity in establishment and persistence of *Rangifer tarandus* populations in the high Arctic. Ecol. Bull. 47:96-104.

Klein, R.D. 1979. Urbanization and Stream Quality Impairment. Water Resources Bulletin 15(4):948-963.

Kleinenberg, S.E., A.V. Yablokov, B.M. Belkovich, and M.N. Tarasevich. 1964. Beluga (*Delphinapterus leucas*): investigation of the species. Akad. Nauk SSSR, Moscow. (In Russ., transl. by Isr. Program for Sci. Transl., Jerusalem, 1969.)

Kleivan, I. 1996. An ethnic perspective on Greenlandic food. In: Jacobsen, B., Andreasen, C., Rygaard, J. (eds.). Cultural and Social Research in Greenland 95/96. Ilisimatusarfik/Atuakkiorfik, Nuuk.

Kline, T.C. Jr. and J.J. Goering. 1998. North Slope Amphidromy Assessment. Final Report, OCS Study MMS 98-0006.

Klinger, L.F., D.A. Walker, and P.J. Webber. 1983. The Effects of Gravel Roads on Alaskan Arctic Coastal Plain Tundra. Pages 628-633 In Permafrost Fourth International Conference Proceedings. National Academy Press, Washington, D.C.

Knutson, H.A. 1980. Geologic and Economic Evaluation of Bituminous Coal, Kukpowruk River Region, Northern Coal Field, Alaska, Focus on Alaska's Coal'80, School of Mineral Industry, University of Alaska, Fairbanks, MIRL Report Number 50.

________ **and K. Steenhof. 2002.** Golden Eagles in the U.S. and Canada; status, trends conservation challenges. J. Raptor Res. 36(supplement):33-41.

Kochert, M.N., K. Steenhof, C.L. McIntyre, and E.H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*). In The Birds of North America, No. 684 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Kochnoev, A.A. 2006. Coastal haulout of Pacific walruses (*Odenbenus romarus divergens*) on Kolyuchin Island, the Chukchi Sea: Marine Mammals of the Holarctic IV, St Petersburg, September 10-14, 2006, p. 266-274.

Kogl, D.R. 1971. Monitoring and Evaluation of Arctic Waters with Emphasis on the North Slope Drainages: Colville River Study. Division of Sports Fish, Alaska Department of Fish and Game. Job No. G-111-A, Project F-9-3, Annual Report 12:23-61. Alaska Department of Fish and Game, Anchorage, Alaska.

________ **and D. Schell. 1974.** Colville River Delta Fisheries Research. In Environmental Studies of the Arctic Estuarine System. Final Report. U.S. Environmental Protection Agency, Ecology Research Service EPA-660/3-75-026. U.S. Environmental Protection Agency, Anchorage, Alaska.

Kohut, R.J., J.A. Lawrence, P. King, and R. Raba. 1994. Assessment of the Effects of Air Quality on Arctic Tundra Vegetation at Prudhoe Bay, Alaska. Final Report. Cornell University, Boyce Thompson Institute for Plant Research, Ithaca, New York.

Kondolf, G.M. 1997. Hungry Water: Effects of Dams and Gravel Mining in River Channels. Environmental Management 21(4):533-551.

Kondratev, A.V. and L.V. Zadorina. 1992. Comparative ecology of the King Eider (*Somateria spectabilis*) and the Spectacled Eider (*S. fischeri*) on the Chaun Tundra. Zoological Journal 71:99-108.

Kornbrath, R.W., M.D. Myers, D.L. Krouskop, J.F. Meyer, J.A. Houle, T.J. Ryherd, and K.N. Richter. 1997. Petroleum Potential of the Eastern National Petroleum Reserve – Alaska: Non-Serialized Report. Alaska Department of Natural Resources, Division of Oil and Gas, Anchorage, Alaska.

Koski, W.R., R.A. Davis, G.W. Miller, and D.E. Withrow. 1993. Reproduction. *In*: Burns, J.J., Montague, J.J., and Cowles, C.J. (eds.). The Bowhead Whale. Special Publication Number 2 of the Society of Marine Mammalogy. Allen Press, Inc. Lawrence, KS.

_______, J. Mocklin, A. Davis, J. Zeh, D. Rugh, J.C. George, and R. Suydam. 2008. Preliminary estimates of 2003-2004 Bering-Chukchi-Beaufort bowhead whale (*Balaena mysticetus*) abundance from photoidentification data. Unpubl. report submitted to Int. Whal. Commn. (SC/60/BRG18). 7pp

_______and G.W. Miller. 2009. Habitat use by different size classes of bowhead whales in the central Beaufort Sea during late summer and autumn. Arctic 62: 137-150.

_______, D.S. Ireland, C. Lyons, K. Christie, A.M. Macrander, and S.B. Blackwell. 2009. An update on feeding by bowhead whales near an offshore seismic survey in the Central Beaufort Sea. SC/61/BRG3 presented to the International Whaling Commission Scientific Committee.

_______, J. Zeh., J. Mocklin, A.R. Davis, D.J. Rugh, J.C. George and R. Suydam. 2010. Abundance of Bering-Chukchi-Beaufort bowhead whales (*Balaena mysticetus*) in 2004 estimated from photoidentification data. J. Cetacean Res. Manage. 11(2): 89–99, 2010.

Kostohrys, J., V. Barber, and T. Hammond. 2000. Water Resources of the Northeast National Petroleum Reserve – Alaska. Bureau of Land Management, BLM-Alaska Open File Report 80.

_______, K. Kosnik, and E. Scott. 2003. Water Resources of the Colville River Special Area, National Petroleum Reserve - Alaska. Bureau of Land Management, BLM-Alaska Open File Report 96.

Kovaks, K.M., C. Lydersen, I. Gjertz. 1996. Birth-site characteristics and prenatal molting in bearded seals (*Erignathus barbatus*). Journal of Mammalogy 77(4): 1085-1091.

Kramer, D.L. 1987. Dissolved Oxygen and Fish Behavior. Environmental Biology of Fishes 18(2):81-92.

Kraemer, L.D., J.E. Berner, and C.M. Furgal. 2005. The potential impact of climate on human exposure to contaminants in the Arctic. International journal of circumpolar health. 64(5):498-508.

Kraus, S.D. 1990. Rates and potential causes of mortality in North Atlantic right whales (*Eubalaena glacialis*). Marine Mammal Science 6(4):278-291.

Krieger K.J., and B.L. Wing. 1986. Hydroacoustic monitoring of prey to determine humpback whale movements. NOAA Technical Memorandum NMFS F/NWC-98. 62 p.

Krogman, B., D. Rugh, R. Sonntag, J. Zeh, and D. Ko. 1989. Ice-based Census of Bowhead Whales Migrating Past Point Barrow, Alaska 1978-1983. Marine Mammal Science 5:116-138.

Kruse, J.A. 1986. Changes in Rural Alaska Settlement Patterns. Alaska Review of Social and Economic Conditions, Institute for Social and Economic Research.

________**. 1991a.** The Alaska North Slope Inupiat and Resource Development: Why the Apparent Success. Institute of Social and Economic Research, University of Alaska Anchorage.

________**. 1991b.** Alaska Iñupiat subsistence and wage employment patterns: understanding individual choice. Human Organization 50: 317-326.

________**. 2006.** Indicators of Social, Economic, and Cultural Cumulative Effects Resulting from Petroleum Development in Alaska: A Review. Mackenzie Valley Joint Review Panel.

________**, M. Baring-Gould, W. Schneider, J. Gross, G. Knapp, and G. Sherrod. 1983.** A Description of the Socioeconomics of the North Slope Borough. Technical Report No. 85 U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Social and Economic Studies Program, Anchorage, Alaska.

Kryter, K.D. 1985. The effects of noise on man. 2nd ed. Academic Press, Orlando, FL. 688 pp.

Kuhnlein H. and O. Receveur. 1996. Dietary Change and Traditional Food Systems of Indigenous Peoples. Annu Rev Nutr 16: 417-442.

Kumar, N., K.J. Bird, P.H. Nelson, J.A. Grow, and Kevin Evens. 2002. A Digital Atlas of Hydrocarbon Accumulations Within and Adjacent to the National Petroleum Reserve – Alaska (NPRA). U.S. Geological Survey Open-File Report 02-71, [http://wrgis.wr.usgs.gov/open-file/of02-071/].

Kunz, M.L. 1977. The Mosquito Lake Site (PSM-049). in: *Pipeline Archaeology*, ed. J.P. Cook, pp. 747-982. Institute of Arctic Biology, University of Alaska, Fairbanks.

________**. 1982.** The Mesa Site: an early Holocene hunting stand in the Iteriak Valley, northern Alaska. *Anthropological Papers of the University of Alaska* 20 (1-2).

________ **and P.G. Phippen. 1988.** An Early Nunamiut Campsite on Confusion Creek: Gates of the Arctic National Park, Alaska. Manuscript on file with Gates of the Arctic National Park, Fairbanks, Alaska.

________ **and K. Troxel. 1989.** Anaktuvuk Pass All-Terrain Vehicle Study, 1986-1988; A Narrative Report of Field Operations and Dispersed ATV Use. U.S. National Park Service, Anchorage.

________ **and R.E. Reanier. 1994**. Paleoindians in Beringia: Evidence from Arctic Alaska. *Science* 263: 660-662

________ **and R.E. Reanier. 1995.** The Mesa Site: A Paleoindian Hunting Lookout in Arctic Alaska. *Arctic Anthropology* 32(1):5-30

________ **and D.H. Mann. 1997.** The Mesa Project: Interactions between Early Prehistoric Humans and Environmental Changes in Arctic Alaska. *Arctic Research of the United States*. National Science Foundation. Spring/Summer:55-62.

________**, P.E. Matheus, D.H. Mann, and P. Groves. 1999.** The Life and Times of Paleoindians in Arctic Alaska. *Arctic Research of the United States*. 13:33-39.

________**, P.E. Matheus, and D.H. Mann. 2000.** Environmental Determinism and Paleoindians in Arctic Alaska. Paper presented at the 65th Annual Meeting of the Society for American Archaeology, Philadelphia, Pennsylvania.

________**, C.M. Adkins, and R.E. Reanier. 2001.** The Batza Téna Obsidian Source: Physical Description and Resource availability. Paper presented at the 28th Annual Meeting of the Alaska Anthropological Association, Fairbanks, Alaska.

________**, and D.C. Slaughter. 2001.** Clovis and the Denbigh Flint Complex: Paleoindian Insights from Paleoeskimo Dynamics. Program and abstracts of the 59th Annual Plains Anthropological Conference. Lincoln, Nebraska, October 31-November 3, 2001

________**. 2002.** NPR-A Field Notes, Kuna River Survey.

________**. 2003.** NPR-A Field Notes, East Fork Kiligwa River Survey.

________**, M. R. Bever, and C. M. Adkins. 2003.** *The Mesa Site: Paleoindians Above the Arctic Circle*. U.S. Department of the Interior, Bureau of Land Management. BLM-Alaska Open File Report 86. Anchorage.

________**, R.O. Mills, D.C. Slaughter, R.E. Reanier, S.J. McIntosh and T. Hamilton. 2005.** 2004 – Punyik Point Revisited. Program and Abstracts of the 32nd Annual Meeting of the Alaska Anthropological Association, Anchorage

________ **and T. Baker. 2005.** Arctic Paleoindian Relationships and Connections to the Pleistocene Cultures of the High Plains Program and Abstracts of the 32nd Annual Meeting of the Alaska Anthropological Association. Anchorage, Alaska, March 10-12, 2005

________**. 2006.** The Denbigh Flint Complex at Punyik Point, Etivluk Lake, Alaska. *Alaska Journal of Anthropology* 3 (2): 101-115.

________ **and C.M. Adkins. 2007.** Beyond Sixty-Eight Degrees: The Northern Archaic Tradition on Alaska's North Slope. Program and Abstracts of the 34th Annual Meeting of the Alaska Anthropological Association. Fairbanks, Alaska, March 14-17, 2007

________**. 2008.** Arctic Paleoindians: A Backwash From The High Plains? Program and Abstracts of the 66th Annual Plains Anthropological Conference, Laramie, Wyoming

________**. 2010.** Clovis Progenitors: Immigrants or Home Grown? Program and Abstracts for the 75th Annual Meeting of the Society for American Archaeology, St Louis Mo.

Kuropat, P.J. 1984. Foraging behavior of caribou on a calving ground in northwestern Alaska. M.S. Thesis. University of Alaska, Fairbanks. ix+95 pp.

______ and J.P. Bryant. 1980. Foraging Patterns of Cow Caribou on the Utukok Calving Grounds in Northwestern Alaska. In Proceedings of the Second International Reindeer/Caribou Symposium, September 17–21, 1979, Røros, Norway, E. Reimers, E. Gaare, and S. Skjenneberg (eds.). Direktoratet for vilt og ferskvannfisk, Trondheim, Norway.

Kurtak, J.M., R.W. Hicks, M.B. Werdon, M.P. Meyer, and C.G. Mull. 1995. Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217

Kuyt, E. 1980. Distribution and breeding of raptors in the Thelon River area, Northwest Territories, 1957–1969. Canadian Field-Naturalist 94:121–130.

Laake, J., A. Punt, R. Hobbs, M. Ferguson, D. Rugh, and J. Breiwick. 2009. Re-analysis of gray whale southbound migration surveys, 1967-2006. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC203, 55 p.

Lachenbruch, A.H. and B.V. Marshall. 1986. Changing Climate – Geothermal Evidence from Permafrost in the Alaskan Arctic. Science (7 November 1986) 234:4777, pp. 689 -696. American Association for the Advancement of Science, Washington, District of Columbia.

Lackenbauer, W.; M.J. Farish; and J. Arthur-Lackenbauer. 2005. The Distant Early Warning (DEW) Bibliography and Documentary Resource List. Calgary, Alberta: Arctic Institute of North America.

Laidre, K.L., I. Stirling, L.F. Lowry, Ø. Wiig, M.P. Heide-Jørgensen, and S.H. Ferguson. 2008. Quantifying The Sensitivity Of Arctic Marine Mammals To Climate-Induced Habitat Change. Ecological Applications 18:S97-S125

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science 17:35-75.

Lampe, L. 1997. Public Testimony. In National Petroleum Reserve – Alaska, Integrated Activity Plan Environmental Impact Statement, Scoping Hearings. Barrow, Alaska.

Lance, R. 2000. Industry Overview – "Doing it Right", The Alpine Development on Alaska's North Slope. Presented at Established Oil Technologies and Practices on Alaska's North Slope Workshop, April 2000, Anchorage, Alaska.

Lanctot, R.B. and C.D. Laredo. 1994. Buff-breasted Sandpiper (*Tryngites subruficollis*). *In* The Birds of North America, No. 91 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Landon, M.G., M. Beller, E. Funk, M. Propst, J. Middaugh, and R.L. Moolenaar. 1997. Alcohol-related Injury Death and Alcohol Availability in Remote Alaska. Journal of the American Medical Association 278(21): 1755-1758.

Lanier, A.P., J.J. Kelly, J. Maxwell, T. McEvoy, C. Holman. 2006. Cancer in Alaska Natives 1969-2003: 35 Year Report. Office of Alaska Native Health Research and Alaska Native Epidemiology Center, Alaska Native Tribal Health Consortium, Anchorage, Alaska: [http://www.anthc.org/chs/epicenter/upload/Cancer_Incidence_35-Year_Report.pdf]

Lantis, M. 1959. Alaskan Eskimo Cultural Values. Polar Notes 1: 35-48.

________**. 1973.** The Current Nativistic Movement in Alaska. In G. Berg [ed.], Circumpolar Problems: Habitat, Economy, and Social Relationships in the Arctic. Pergamon Press, Elmsford, New York

Larned, W.W. and D. Zwiefelhofer. 1995. Distribution and abundance of Steller's eiders (*Polysticta stelleri*) in the Kodiak Archipelago, Alaska: March 1994. Unpublished report prepared by U.S. Fish and Wildlife Service, Anchorage, AK. 18 pp.

________ **and G. Balogh. 1997.** Eider Breeding Population Survey. Arctic Coastal Plain, Alaska, 1992-1996. Unpublished Report. U.S. Dept. of Interior, U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska.

________**. 2005.** Trip report – Aerial survey of Lower Cook Inlet to locate molting flocks of Steller's eiders and Mergansers 14 September 2005. U.S. Dept. of Interior, U.S. Fish and Wildlife Service, Migratory Bird Management, Soldotna, AK.

________**, R. Stehn, and R. Platte. 2006.** Eider Breeding Population Survey Arctic Coastal Plain, Alaska 2006. U.S. Department of Interior, U.S. Fish and Wildlife Service, Anchorage, Alaska.

________**. 2007.** Steller's Eider Spring Migration Surveys, Southwest Alaska 2007. Unpublished Report. U.S. Dept. of Interior, U.S. Fish and Wildlife Service, Migratory Bird Management Waterfowl Branch, Anchorage, Alaska.

________**, R. Stehn, and R. Platte. 2009.** Waterfowl breeding population survey Arctic Coastal Plain, Alaska 2008. Unpublished Report U.S. Fish and Wildlife Service, Anchorage, AK. 42 pp.

________**, K. Bollinger, and R. Stehn. 2009a**. Late winter population and distribution of spectacled eiders (*Somateria fischeri*) in the Bering Sea 2009. Preliminary U.S. Fish and Wildlife Service report that is part of a study entitled: Measuring and modeling habitat use by spectacled eiders wintering in the Bering Sea. Primary Investigator: Dr. James Lovvorn, Southern Illinois University. Project No. 820, U.S. Department of Commerce, NOAA, as recommended by the North Pacific Research Board. 5 pp.

________**, R. Stehn, and R. Platte. 2010.** Waterfowl breeding population survey, Arctic Coastal Plain, Alaska, 2009. Unpublished Report U.S. Fish and Wildlife Service, Division of Migratory Bird Migratory Management, Anchorage, Alaska. 45 pp.

________ **and K. Bollinger. 2011**. Steller's Eider Spring Migration Surveys, Southwest Alaska 2010. Unpublished Report. U.S. Dept. of Interior, U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska.

_______**, R. Stehn, and R. Platte 2011a.** Waterfowl breeding population survey Arctic Coastal Plain, Alaska 2010. Unpublished Report U.S. Fish and Wildlife Service, Anchorage, AK. 54 pp.

Larsen, H. and F. Rainey. 1948. Ipiutak and the Arctic Whale Hunting Culture. *Anthropological Papers of the American Museum of Natural History* 42.

Lawhead, B.E. 1988. Distribution and movements of Central Arctic Herd caribou during the calving and insect seasons. Pp. 8-13 in R.D. Cameron and J.L. Davis, eds., Reproduction and calf survival. Wildl. Tech. Bull. No. 8. Alaska Dept. Fish and Game, Juneau.

_______ **and J.A. Curatolo. 1984.** Distributions and movements of the Central Arctic herd, summer 1983. Final Report. Prepared by Alaska Biological Research, Inc., Fairbanks, Alaska, for ARCO Alaska, Inc., Anchorage, Alaska.

_______ **and D.A. Flint. 1993.** Caribou Movements in the Vicinity of the Planned Drill Site 3-T Facilities, Kuparuk Oilfield, Alaska, 1991-1992. Progress Report. ARCO Alaska, Inc., and the Kuparuk River Unit, Anchorage, Alaska.

_______**, C.B. Johnson, and L.C. Byrne. 1994.** Caribou Surveys in the Kuparuk Oilfield During the 1993 Calving and Insect Seasons. Unpublished Report. ARCO Alaska, Inc., Anchorage, Alaska.

_______**. 1997.** Caribou and Oil Development in northern Alaska: lessons from the Central Arctic Herd. In NPR-A Symposium Proceedings, Science; Traditional Knowledge, and the Resources of the Northeast Planning Area of the National Petroleum Reserve – Alaska. Anchorage, AK., Apr. 16-18, 1997. OCS Report, MMS 97-0013. Anchorage, AK: USDOI, BLM and MMS, pp. 7-5 to 7-7.

_______**, C.B. Johnson, A.M. Wildman, and J.R. Rose. 1997.** Caribou Distribution, Abundance and Calf Production in the Kuparuk Oilfield during the 1996 Calving Season. Final Report. Prepared by ABR, Inc., Fairbanks, Alaska.

_______**and C.B. Johnson. 2000.** Surveys of caribou and muskoxen in the Kuparuk-Colville Region, Alaska, 1999, with a summary of caribou calving distribution since 1993. Final Report. Prepared by ABR, Inc., Fairbanks, Alaska, for Phillips Alaska, Inc.

_______ **and A.K. Prichard. 2002.** Surveys of caribou and muskoxen in the Kuparuk-Colville Region, Alaska, 2001. Final Report. Prepared by ABR, Inc., Fairbanks, Alaska, for Phillips Alaska, Inc.

_______**, A.K. Prichard, M.J. Macander, and M. Emers. 2003.** Caribou mitigation monitoring for the Meltwater Project, 2002. Prepared by ABR, Inc., Fairbanks, Alaska.

_______**, A.K. Prichard, M.J. Macander, and M. Emers. 2004.** Caribou Mitigation Monitoring for the Meltwater Project, 2003. Third Annual Report. Prepared for ConocoPhillips Alaska Inc., Anchorage, Alaska by ABR Inc. - Environmental Research & Services, Fairbanks, Alaska.

________, **J.P. Parrett, A.K Prichard, and D.A. Yokel. 2006.** A literature review and synthesis on the effect of pipeline height on caribou crossing success. BLM Alaska Open File Report 106, BLM/AK/ST-06/016+6501+020. Fairbanks, AK. 96 pp.

________, **A.K. Prichard and M.J. Macander. 2006a.** Caribou monitoring study for the Alpine Satellite Development Program, 2005: annual report. unpubl. rept. prepared by ABR, Inc. – Environmental Research and Services for ConocoPhillips Alaska, Inc., Anchorage, AK.

Lawler, J. 2004. Demography and home ranges of Dall's sheep in the central Brooks Range, Anaktuvuk Pass, Alaska; final report: 2004. Technical Report NPS/AR/NRTR-2004-43. U.S. Dept. of Interior, National Park Service, Fairbanks, Alaska. 56 pp.

Lawrence, D. and A. Slater. 2005. A Projection of Severe Near-Surface Permafrost Degradation During the 21st Century. Geophysical Research Letters 32(L24401):5.

Lawson, D.E., J. Brown, K.R. Everett, A.W. Johnson, V. Komarkova, B.M. Murray, D.F. Murray, and P.J. Webber. 1978. Tundra Disturbances and Recovery Following the 1949 Exploratory Drilling, Fish Creek, Northern Alaska. U.S. Army, Cold Regions Research and Engineering Laboratory 83-36. Hanover, New Hampshire.

________, **J. Brown, K.R. Everett, A.W. Johnson, V. Komarkova, B.M. Murray, D.F. Murray, and P.J. Webber. 1986.** Response of Permafrost Terrain to Disturbance: A Synthesis of Observations from Northern Alaska, U.S.A. Arctic and Alpine Research 18(1):1-17.

Leatherwood, J.S. and M.E. Dahlheim. 1978. Worldwide distribution of pilot whales and killer whales. Naval Ocean Systems Center, Tech. Rep. 443:1-39.

________, **Reeves, R.R., Perrin, W.F., and Evans, W.E. 1982.** Whales, dolphins, and porpoises of the eastern North Pacific and adjacent Arctic Waters, a guide to their identification. NOAA Technical Report NMFS Circular 444.

Le Boeuf, B.J., H.M. Pérez-Cortéz, J. Urban, B.R. Mate, and F. Ollervides. 2000. High gray whale mortality and low recruitment in 1999: potential causes and implications. J. Cetacean Res. Manage. 2(2): 85-99.

Lefebure, D.V. and B.N. Church, B.N. 1996. Polymetallic Veins Ag-Pb-Zn+/-Au, in Selected British Columbia Mineral Deposit Profiles, Volume 2 - Metallic Deposits, Lefebure, D.V. and Hõy, T, Editors, British Columbia Ministry of Energy of Employment and Investment, Open File 1996-13, pages 67-70.

Leffingwell, E. de K. 1919. The Canning River Region, Northern Alaska. U.S. Geological Survey Professional Paper 109. U.S. Government Printing Office, Washington, DC.

Lehr, W.J. 2001. Review of Modeling Procedures for Oil Spill Weathering. Pages 51-90 In Oil Spill Modeling and Processes, C.A. Brebbia (ed.). WIT Press, Boston, Massachusetts.

Lemke, P., J. Ren, R.B. Alley, I. Allison, J. Carrasco, G. Flato, Y. Fujii, G. Kaser, P. Mote, R.H. Thomas and T. Zhang. 2007. Observations: Changes in Snow, Ice and Frozen Ground. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Lenart, E.A. 1999. Central Arctic Herd. In Caribou. Management Report of Survey-Inventory Activities, M.V. Hicks (ed.). Federal Aid in Wildlife Restoration Grants W-24-5 and W-27-1. Alaska Department of Fish and Game, Juneau, Alaska.

_______. **2003.** Caribou survey-inventory management report, units 26B and 26C. In Inventory management report – caribou, July 1, 1998 – June 30, 2001, M.V. Hicks (ed.). Federal Aid in Wildlife Restoration Grants W-24-5 and W-27-1. Alaska Department of Fish and Game, Juneau, Alaska.

_______. **2005.** Units 23 East, 24 West, and portions of Unit 26A Dall sheep management report. pp. 160-176 in C. Brown, editor. Dall sheep management report of survey and inventory activities 1 July 2001-30 June 2004. Alaska Department of Fish and Game. Project 6.0. Juneau, Alaska.

_______. **2007a.** Units 25A, 25B, 25D, 26B, and 26C brown bear. pp. 300-323 in P. Harper, editor. Brown bear management report of survey and inventory activities 1 July 2004-30 June 2006. Alaska Department of Fish and Game. Project 4.0. Juneau, AK.

_______. **2007b.** Units 26B and 26C caribou. pp. 284-308 in P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2004-30 June 2006. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

_______. **2007c.** Units 26B and 26C muskox. pp. 49-69 in P. Harper, editor. Muskox management report of survey and inventory activities 1 July 2004-30 June 2006. Alaska Department of Fish and Game. Project 16.0. Juneau, Alaska, USA.

_______. **2010.** Central Arctic Caribou Herd. Slide presentation at 1/14/2010 meeting of the North Slope Borough Fish and Game Management Committee. Barrow, AK.

Lent, P.C. 1980. Synoptic snowmelt patterns in Arctic Alaska in relation to caribou habitat use. In Proceedings of the Second International Reindeer/Caribou Symposium, E. Reimers, E. Gaare, and S. Skennsberg, eds. Roros, Norway, Sept. 17-21, 1979. Trondheim, Norway: Direktoratet for vilt og ferskvannsfisk.

Lentfer, J.W., R.J. Hensel, J.R. Gilbert, and F.E. Sorensen. 1980. Population characteristics of Alaskan polar bears. International Conference on Bear Research and Management 3: 109-115.

Leonard, J.A., R.K. Wayne, J. Wheeler, R. Valdez, S. Guillen, and C. Vila. 2002. Ancient DNA Evidence for Old World Origin of New World Dogs. *Science* 298: 1613-1616

Leopold, L.B. 1994. A View of the River. Harvard University Press, Cambridge, MA.

Lerand, M. 1973. Beaufort Sea. In: The Future Petroleum Provinces of Canada-Their Geology and Potential, R.G. McCrossam, ed. Memoir 1. Canadian Society of Petroleum Geologists, pp. 315-386.

Lesack, L. and P. Marsh. 2007. Lengthening Plus Shortening of River-to-Lake Connection Times in the Mackenzie River Delta Respectively via Two Global Change Mechanisms Along the Arctic Coast. Geophysical Research Letters 34(L23404):1-6.

Lesage V., C. Barette., M.C.S. Kingsley, and B. Sjare. 1999. The Effect of Vessel Noise on the Vocal Behavior of Belugas in the St. Lawrence River Estuary. Canada. Mar. Mamm. Sci. 15: 65-84.

Lester, D. 1999. Native American suicide rates, acculturative stress, and traditional integration. Psychological Reports 84(2): 398.

Lewellen Arctic Research and Polar Alpine, Inc. 2000. Early Tundra Access Project. August 2000. 18p.

Lewis, J.P. and R. Sellers. 1991. Assessment of the Exxon Valdez Oil Spill on Brown Bears on the Alaska Peninsula. In Exxon Valdez Oil Spill Natural Resource Damage Assessment. NRDA Terrestrial Mammal Study No. 4. Unpublished Final Report. U.S. Environmental Protection Agency, Natural Resource Damage Assessment, Anchorage, Alaska.

Lewis, T.L., P.L. Flint, J.A. Schmutz, and D.V. Derksen. 2009. Temporal distributions and patterns of habitat use by black brant molting in the Teshekpuk Lake Special Area, Alaska. Unpublished report for the Bureau of Land Management Fairbanks, AK by U.S. Geologic Survey, Anchorage AK. 124pp.

_______, P.L. Flint, J.A. Schmutz, and D.V. Derksen. 2010. Pre-moult patterns of habitat use and moult site selection by Brent Geese (*Branta bernicla nigricans*) :individuals prospect for moult sites. Ibis 152:556-568.

LGL Ltd. and Greeneridge Sciences Inc. 1987. Response of bowhead whales to an offshore drilling operation in the Beaufort Sea, autumn 1986. Report from LGL Ltd., King City, Ontario Canada and Greeneridge Sciences, Inc., Santa Barbara, CA for Shell Western E&P Inc., Anchorage, AK.

Libbey, D. and Hall, E.S., Jr. 1981. Cultural resources in the mid-Beaufort Sea region. A report for the North Slope Borough's Coast Zone Management Plan. Box 69, Barrow, AK 99723.

Liebezeit, J. and S. Zack. 2006. Breeding bird diversity, density, nesting success and nest predators in the Olak region of the Teshekpuk Lake Special Area – 2006. Unpublished report by Wildlife Conservation Society Portland, OR. 37pp.

_______ and S. Zack. 2007. Breeding bird diversity, density, nesting success and nest predators in the Olak region of the Teshekpuk Lake Special Area – 2007. Unpublished report by Wildlife Conservation Society Portland, OR. 39pp.

_______ and S. Zack. 2008. Breeding bird diversity, density, nesting success and nest predators in the Olak region of the Teshekpuk Lake Special Area – 2008.

________, **S.J. Kendall, S. Brown, C.B. Johnson, [and others]. 2009.** Influence of human development and predators on nest survival of tundra birds, Arctic Coastal Plain, Alaska Ecological Applications, 19(6):1628–1644.

Limpert, R.J. and S.L. Earnst. 1994. Tundra Swan (*Cygnus columbianus*). In: The Birds of North America, No. 89 (A. Poole and F. Gill, eds). The Birds of North America, Inc., Philadelphia, PA.

Lindsey, K.D. 1986. Paleontological Inventory and Assessment of Public Lands Administered by Bureau of Land Management, State of Alaska. Anchorage, Alaska: USDOI BLM pp. 121-187.

Lindström, Å. 1991. Maximum fat deposition rates in migrating birds. Ornis Scand. 22, 12–19.

Lindzen, R.S. 1992. Global Warming: The Origin and Nature of the Alleged Scientific Consensus, Regulation Magazine, Vol. 15, No. 2, Spring 1992.

Lipkin, R. 1994. Personal Communication. As cited in public hearings for the Northeast National Petroleum Reserve – Alaska Integrated Activity Plan/Environmental Impact Statement, January 13, 1998. Nuiqsut, Alaska. U.S. Department of Interior, Bureau of Land Management, Anchorage, Alaska.

________**. 1997.** Known Rare or Sensitive Plant Species Within the Planning Area. In: The NPR-A Symposium: Science, Traditional Knowledge, and the Resources of the Northeast Planning Area of the National Petroleum Reserve in Alaska. Apr. 16-18, 1997, Anchorage, AK. Anchorage, AK: USDOI, BLM, and MMS.

________ **and D.F. Murray. 1997.** Alaska Rare Plant Field Guide. Anchorage, AK: USDOI: FWS, NPS and BLM.

________**. 2006.** Alaska Natural Heritage Program, botanist. Personal communication by e-mail with Dave Yokel, BLM, Arctic Field Office wildlife biologist, 03-08-2006 and 03-09-2006.

Ljungblad, D.K., S.E. Moore, and D.R. Van Schoik. 1986. Seasonal Patterns of Distribution, Abundance, Migration and Behavior of the Western Arctic Stock of Bowhead Whales, *Balaena mysticetus* in Alaskan Seas. Reports of the International Whaling Commission 8:177-205.

London Health Commission. 2003. Noise and Health: Making the Link. London: London Health Commission.

Loring, P.A, L.K. Duffy, and M.S. Murray. 2010. A risk-benefit analysis of wild fish consumption for various species in Alaska reveals shortcomings in data and monitoring needs. Science of the Total Environment 408: 4532–4541

Loseto, L.L., P. Richard, G.A. Stern, J. Orr, and S.H. Ferguson. 2006. Segregation of Beaufort Sea beluga whales during the open-water season. Can. J. Zool. 84:1743-1751.

Loucks, E.B., L.M. Sullivan, L.J. Hayes, R.B. D'Agostino Sr., M.G. Larson and R.S. Vasan. 2006. Association of Educational Level with Inflammatory Markers in the Framingham Offspring Study. Am J Epidemiol 163(7): 622-8.

Lovvorn, J.R., S.E. Richman, J.M. Grebmeier, and L.W. Cooper. 2003. Diet and Body Condition of Spectacled Eiders Wintering in Pack Ice of the Bering Sea. Polar Biology 26: 259-267.

Lowenstein, T. 1981. Some Aspects of Sea Ice Subsistence Hunting in Point Hope, Alaska. North Slope Borough, Coastal Zone Management Plan, Barrow, Alaska

Lowry L.F., K.J. Frost, and J.J. Burns. 1980. Variability in the diet of ringed seals, *Phoca hispida,* in Alaska. Can J Fish Aquat Sci. 37:2254–2261.

________, K.J. Frost, and J.J. Burns. 1980b. Feeding of bearded seals in the Bering and Chukchi seas and trophic interactions with Pacific walruses. Arctic 33: 330-342.

________, K.J. Frost, R. Davis, D.P. DeMaster, R.S. Suydam. 1998. Movements and behavior of satellite-tagged spotted seals (*Phoca largha*) in the Bering and Chukchi Seas. Polar Biology19:221-230.

________. 1984. The spotted seal (*Phoca largha*). Pp. 1-11 *In* Alaska Dep. Fish and Game marine mammal species accounts. Vol. 1. Juneau, Alaska.

________, R.R. Nelson, and K.J. Frost. 1987. Observations of killer whales (*Orcincus orca*) in western Alaska: sightings, strandings and predation on other marine mammals. Canadian Field-Naturalist 101:6–12.

________. 1993. Foods and feeding ecology. Pages 201–38 in: J.J. Burns, J.J. Montague and C.J. Cowles eds. The Bowhead Whale. Special Publication No. 2, Society for Marine Mammalogy, Lawrence, KS.

________, Frost K, and K.W. Pitcher. 1994. Observations of Oiling of Harbor Seals in Prince William Sound. Pages 209-225 in T.R. Loughlin, ed. Marine Mammals and the Exxon Valdez. Academic Press, San Diego, CA.

________. 2000. Marine mammal-sea ice relationships. Pages 91-96 in H. P. Huntington, editor. Report of the Marine Mammal Commission Workshop: Impacts of Changes in Sea Ice and Other Environmental Parameters in the Arctic, Girdwood, AK. Marine Mammal Commission.

________ and K. Frost. 2002. Beluga whale surveys in the eastern Chukchi Sea, July 2002. Alaska Beluga Whale Committee Rep. 02-2 submitted to NMFS, Juneau, AK. 10 pp.

________, G. Sheffield, and J.C. George. 2004. Bowhead whale feeding in the Alaskan Beaufort Sea, based on stomach content analysis. J. Cetacean Res. Manage. 6(3):215-223.

Lubchenco J., M. McNutt, B. Lehr, M. Sogge, M. Miller, S. Hammond, and W. Conner. 2010. Deepwater Horizon/BP Oil Budget: What happened to the oil? Silver Spring, MD: National Oceanic and Atmospheric Administration. Available at http://www.noaanews.noaa.gov/stories2010/PDFs/OilBudget_description_%2083final.pdf.

Lugas'kov, A.V. and L.N. Stepanov. 1988. Feeding and Movement of Broad Whitefish, *Coregonus nasus*, in the Lower Ob' Basin. Journal of Ichthyology 29:64-72.

Luton, H.H. 1985. Effects of Renewable Resource Harvests Disruptions on Socioeconomic and Sociocultural Systems: Wainwright, Alaska. Technical Report No. 91. U.S. Department of the Interior, Minerals Management Service, Outer Continental Shelf Regions, Social and Economic Studies Program, Anchorage, Alaska.

Lyons, C., W.R. Koski, and D.S. Ireland. 2009. Beaufort Sea aerial marine mammal monitoring program. (Chapter 7) *In:* Ireland, D.S., D.W. Funk, R. Rodrigues, and W.R. Koski (eds.). Joint monitoring program in the Chukchi and Beaufort seas, open water seasons, 2006–2007. LGL Alaska Report P971-2. Report from LGL Alaska Research Associates, Inc., Anchorage, AK, LGL Ltd., environmental research associates, King City, Ont., JASCO Research Ltd., Victoria, B.C., and Greeneridge Sciences, Inc., Santa Barbara, CA, for Shell Offshore, Inc., Anchorage AK, ConocoPhillips Alaska, Inc., Anchorage, AK, and the National Marine Fisheries Service, Silver Springs, MD, and the U.S. Fish and Wildlife Service, Anchorage, AK. 485 p. plus Appendices.

Lysne, M.C. 2002. Ethnic identity and acculturation processes in urban Native Americans: Relationships to alcohol expectancies and alcohol use. Ph.D. dissertation, University of Wyoming, United States -- Wyoming. Retrieved May 28, 2008, from Dissertations & Theses: A&I database. (Publication No. AAT 3079587).

Mac, M.J. 1985. Effects of Ration Size on Preferred Temperature of Lake Charr, *Salvelinus namaycush*. Environmental Biology of Fishes 14(2/3):227-231.

Macdonald, D. 2001. Encyclopedia of Mammals. Oxford University Press. Oxforshire, UK. 930 pp.

MacDonald, S.O. and J.A. Cook. 2009. Recent Mammals of Alaska. Univ. of Alaska Press, Fairbanks, Alaska.

Machida, S. 1994. Brown Bear Survey-Inventory Performance Report, Unit 26A, M.V. Hicks, ed. Federal Aid in Wildlife Restoration Annual Performance Report-Brown Bear, 1 July 1993-30 June 1994. Grant W-24-2 Study 4.0. Juneau, AK: State of Alaska, Dept. of Fish and Game.

Mack, M. C., M.S. Bret-Harte, T.K.N. Hollingsworth, R.R. Jandt, E.A.G. Schuur, G.R. Shaver, and D.L. Verbyla. 2011. Carbon loss from an unprecedented Arctic tundra wildfire. Nature 475: 489–492.

Mackenzie-Grieve, J.L. and J.R. Post. 2006. Thermal Habitat Use by Lake Trout in Two Contrasting Yukon Territory Lakes. Transactions of the American Fisheries Society 135:727-738.

MacLean, N.G., J.M Gunn, F.J. Hicks, P.E. Ihssen, M. Malhiot, T.E. Mosindy, and W. Wilson. 1990. Environmental and Genetic Factors Affecting the Physiology and Ecology of Lake Trout. Lake Trout Synthesis, Ontario Ministry of Natural Resources, Toronto.

Magdanz, J.S., C.J. Utermohle, and R.J. Wolfe. 2002. The production and distribution of wild food in Wales and Deering, Alaska. Technical Paper 259. Alaska Department of Fish and Game, Division of Subsistence, Juneau, Alaska.

________, R.J. Walker, and R. Paciorek. 2004. The Subsistence Harvests of Wild Foods by Residents of Shungnak, Alaska, 2002. Technical Paper 279. Alaska Department of Fish and Game, Division of Subsistence, Anchorage, Alaska.

Magnuson, J.J., L.B. Crowder, and P.A. Medvick. 1979. Temperature as an Ecological Resource. American Zoologist 19:331-343.

________, J.D. Meisner, and D.K. Hill. 1990. Potential Changes in the Thermal Habitat of Great Lakes Fish after Global Climate Warming. Transactions of the American Fisheries Society 119:254-264.

Magoun, A.J. 1979. Studies of wolverines on and adjacent to NPR-A. pp. 89-128 in P. C. Lent (ed). Studies of selected wildlife and fish and their use of habitats on and adjacent to NPR-A, 1977-1978. Vol. 1. NPR-A Work Group 3, Anchorage, AK.

________. 1985. Population characteristics, ecology, and management of wolverines in northwestern Alaska. Ph.D. dissertation. University of Alaska, Fairbanks. xii+197 pp.

________. 2005. Former Alaska Department of Fish and Game biologist. Conversation transmitted by e-mail to Dave Yokel, BLM, Arctic Field Office wildlife biologist and dated 12-14-2005.

________ and J.P. Copeland. 1998. Characteristics of wolverine reproductive den sites. Journal of Wildlife Management 62:1313-1320.

Maher, W.J. 1959. Habitat Distribution of Birds Breeding Along the Upper Koalak River, Northern Alaska. Condor 61(5): 351-368.

________. 1970. The Pomarine Jaeger as a brown lemming predator in northern Alaska. Wilson Bull. 82: 130-157.

________. 1974. Ecology of Pomarine, Parasitic and Long-tailed Jaegers in Northern Alaska. Pacific Coast Avifauna, Number 37. Los Angeles, California, Cooper Ornithological Society.

Mahon, S., R.F. Addison, and D.E. Willis. 1987. Effects of Scotian Shelf Natural Gas Condensate on the Mummichog. Marine Pollution Bulletin 18(2):74-77.

Malins, D.C. (ed.). 1977. Effects of Petroleum on Arctic and Subarctic Marine Environments and Organisms, Volume II: Biological Effects. Academic Press, Inc., New York, NY.

Mallek, E.J., R. Platte, and R. Stehn. 2006. Aerial breeding pair surveys of the Arctic Coastal Plain of Alaska - 2005. U.S. Fish and Wildlife Service, Waterfowl Management, Fairbanks, AK.

_______, R. Platte, and R. Stehn. 2007. Aerial breeding pair surveys of the Arctic Coastal Plain, Alaska, 2007. Unpublished Report U.S. Fish and Wildlife Service, Anchorage, AK 25 pp.

_______ and J. Wortham. 2008. Winter waterfowl Survey Mexico West Coast and Baja California. Unpublished Report U.S. Fish and Wildlife Service, Waterfowl Management, Fairbanks, AK.

_______. 2009. Teshekpuk Lake Area Molting Goose Survey – 2008. U.S. Fish and Wildlife Service, Waterfowl Management, Fairbanks, AK. 13pp.

_______. 2011. Teshekpuk Lake Area Molting Goose Survey – 2010. U.S. Fish and Wildlife Service, Waterfowl Management, Fairbanks, AK. 16pp.

Mallet, J.P., S. Charles, H. Persat, and P. Auger. 1999. Growth Modeling in Accordance with Daily Water Temperature in European Grayling (*Thymallus Thymallus L.*). Canadian Journal of Fisheries and Aquatic Sciences 56(6):994-1000.

Mallory, C.R. 1998. A Review of Alaska North Slope Blowouts, 1974-1997. Document II-9 *In* Preliminary Analysis of Oil Spill Response Capability in Broken Ice to Support Request for Additional Information for Northstar Oil Spill Contingency Plan. Volume 2. Prepared for BP Exploration (Alaska), Inc., and ARCO Alaska, Anchorage, Alaska.

Malme, C.I., Würsig, B., Bird J.E., Tyack P. 1986. Behavioral responses of gray whales to industrial noise: feeding observations and predictive modeling. Final Report, Outer Continental Shelf Environmental Assessment Program, Research Unit 675. BBN Laboratories, MA.

Mandryk, C.A. 1993. A Historical and Sociopolitical Analysis of the Ice-Free Corridor. Program and Abstracts of the 58th Annual Meeting of the Society for American Archaeology, St. Louis, Mo.

_______, H. Josenhans, D.W. Fedje, and R.W. Mathewes. 1998. Evaluating Paleoenvironmental Constraints on Interior and Coastal Entry Routes into North America. Program and Abstracts for the 64th Annual Meeting of the Society for American Archaeology, Seattle, Washington.

Maniilaq Association. 2010. Health Services [http://www.maniilaq.org/healthServices.html]

Mann, D.H. and T.D. Hamilton. 1995. Late Pleistocene and Holocene paleoenvironments of the North Pacific coast. *Quaternary Science Reviews* 14:449-471.

_______, D.M. Peteet, R.E. Reanier, and M.L. Kunz. 2002. Responses of an Arctic Landscape to Late Glacial and Early Holocene Climate Changes: the Importance of Moisture. *Quaternary Science Reviews* 21:997-1021.

_______, P. Groves, and M.L. Kunz. 2008. Prehistoric Changes in Climate, Landscape, and Large Mammal Faunas in the Arctic Foothills, Northern Alaska. American Association for the Advancement of Science, Alaska Meetings, Fairbanks, Alaska.

________, P. Groves, R.E. Reanier, and M.L. Kunz. 2010. Floodplains, permafrost, cottonwood trees, and peat: What happened the last time the climate warmed suddenly in Arctic Alaska. *Quaternary Science Reviews*, In Press.

Mann, M.E., R.S. Bradley, and M.K. Hughes. 1999. Northern hemisphere temperatures during the past millennium: inferences, uncertainties, and limitations. Geophysical Research Letters 26:759-762.

Mansfield, A.W. 1983. The effects of vessel traffic in the arctic on marine mammals and recommendations for future research. Government of Canada Fisheries and Oceans, Canadian Technical Reports in Fisheries and Aquatic Sciences No. 1186. 97 p.

Markon, C. 1986. Arctic National Wildlife Refuge Land-Cover Mapping Project User's Guide. Unpublished report. Anchorage, AK: U.S. Geological Survey, 14 pp.

________ and D.V. Dirksen. 1994. Identification of tundra land cover near Teshekpuk Lake, Alaska, using SPOT satellite data. Arctic 47: 222-231.

Marmot, M., S. Friel, R. Bell, T. Houweling, and S. Taylor. 2008. Closing the gap in a generation: health equity through action on the social determinants of health. Lancet Nov 8;372(9650):1661-9.

Mars, J.C. and D.W. Houseknecht. 2007. Quantitative Remote Sensing Study Indicates Doubling of Coastal Erosion Rate in the Past 50 Years Along a Segment of the Arctic Coast, Alaska. Geology 35(7):583–586.

Marsh, P., M. Russell, S. Pohl, H. Haywood, and C. Onclin. 2009. Changes in Thaw Lake Drainage in the Western Canadian Arctic from 1950 to 2000. Hydrological Processes 23:145-158.

Marston, M.R.M. 1969. Men of the Tundra: Eskimos at War. October House, New York.

Martin, N.V. and C.H. Olver. 1980. The Lake Charr, *Salvelinus namaycush*. Pages 205-277 in E.K. Baton, editor. Charrs: Salmonid Fishes of the Genus *Salvelinus*. Dr. W. Junk BV Publishers, The Hague, The Netherlands.

Martin, P.D., J.L. Jenkins, F.J. Adams, M.T. Jorgensen, A.C. Matz, D.C. Payer, P.E. Reynolds, A.C. Tidwell, and J.R. Zelenak. 2009. Wildlife Response to Environmental Arctic Change: Predicting Future Habitats of Arctic Alaska. Report of the Wildlife Response to Environmental Arctic Change (WildREACH): Predicting Future Habitats of Arctic Alaska Workshop, November 17-18, 2008. U.S. Fish and Wildlife Service, Fairbanks, Alaska.

________, D.C. Douglas, and T. Obritschkewitsch. In prep. Distribution and movements of Steller's eiders in the non-breeding period.

Martin, S. 1979. A Field Study of Brine Drainage and Oil Entrainment in First-Year Sea Ice. Journal of Glaciology 22:473-502.

Martin, S. 2005. Doctoral dissertation: Determinants of Well-Being in Inupiat and Yupiit Eskimos: Do Communities Matter? University of Texas, Dallas.

_______, M. Killorin, and S. Colt. 2008. Fuel Costs, Migration, and Community Viability. Prepared for The Denali Commission. Institute of Social and Economic Research, University of Alaska Anchorage. http://www.alaskapower.org/pdf/Fuelcost_viability_final.pdf

Maslanik, J.A., M.C. Serreze, and R.G. Barry. 1996. Recent decreases in Arctic summer ice cover and linkages to atmospheric circulation anomalies. Geophysical Research Letters 23:1677–1680.

_______, M.C. Serreze, and T. Agnew. 1999. On the record reduction in 1998 western Arctic sea-ice cover. Journal of Geophysical Research 26(13): 1905-1908.

Matheus, P.E. 1998. Late Quaternary Mammal Fossils of the Ikpikpuk River, National Petroleum Reserve – Alaska. Manuscript on file with the Bureau of Land Management, Northern Field Office, Fairbanks, Alaska.

_______. 2000. Late Quaternary Mammal Fossils of the Greater Ikpikpuk River Area, National Petroleum Reserve – Alaska. Manuscript on file with the Bureau of Land Management, Northern Field Office, Fairbanks, Alaska.

_______, D. Guthrie, and M.L. Kunz. 2003. Using Frequency Distributions of Radiocarbon Dates to Detect Relative Changes in Pleistocene Mammal Populations – A Test Case From Northern Alaska, Program and Abstracts of the 3rd International Mammoth Conference, Whitehorse, Yukon, Canada.

Matthews, W.J. 1998. Patterns in Freshwater Fish Ecology. Kluwer Academic Publishers, Norwell, MA.

Matz, A. 2010. Contaminants in yellow-billed loons and their prey. Annual report to BLM from U.S. Fish and Wildlife Service, Fairbanks, AK.

Maxim, L.D. and R.W. Niebo. 2002. Appendix B Oil Spill Analysis for North Slope Oil Production and Transportation Operations. In Environmental Report for Trans Alaska Pipeline System Right-Of Way Renewal Volume 1 of 2. Trans Alaska Pipeline System Owners, Anchorage, AK.

May, C.W., E.B. Welch, R.R. Horner, J.R. Karr, and B.W. Mar. 1997. Quality Indices for Urbanization Effects in Puget Sound Lowland Streams. Water Resources Series Technical Report 154.

Mayfield, C.F., I.L. Tailleur, and C.E Kirschner. 1988. Bedrock geologic map of the National Petroleum Reserve in Alaska, in Gryc, George, ed., Geology and exploration of the National Petroleum Reserve in Alaska, 1974 to 1982: U.S. Geological Survey Professional Paper 1399, p. 187-190, scale 1:500,000.

MBC Applied Environmental Sciences. 2004. Proceedings of a Workshop on the Variability of Arctic Cisco (Qaataq) in the Colville River. Prepared for U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region, Anchorage, Alaska. OCS Study MMS 2004-033.

McAninch, J. 2010. Northern Health Impact Resource Group. North Slope Borough Baseline Community Health Analysis. In-progress draft report, NSB Department of Health and Social Services, North Slope Borough, Alaska.

McCaffery, B. 1998. The status of loons in Alaska, a preliminary needs assessment. Alaska Loon Working Group. Unpublished report. U.S. Fish and Wildlife Service. Anchorage, Alaska.

_______ and R. Gill. 2001. Bar-tailed Godwit (*Limosa lapponica*). *In* The Birds of North America, No. 581 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

_______, R.E. Gill, and D.R. Ruthrauff. 2006. Bar-tailed Godwits staging in western Alaska: evidence of steep population decline. Wader Study Group Bull. 109: 39.

McCarthy, T.M. and R.J. Seavoy. 1994. Reducing Nonsport Losses Attributable to Food Conditioning: Human and Bear Modification in an Urban Environment. Pages 75-84 In Ninth International Conference on Bear Research and Management Bears - Their Biology and Management, February 1992, Missoula, Montana, J.J. Claar and P. Schullery (eds.). International Association for Bear Research and Management, Vancouver, British Columbia.

McCartney, A.P. 1980. The Nature of Thule Eskimo Whale Use. *Arctic* 33(3):517-541.

_______. 1988. Late Prehistoric Metal Use in the New World Arctic in *The Late Prehistoric Development of Alaska's Native People*, eds. Shaw R.D., R.K. Harritt, D.E. Dumond. Aurora, Alaska Anthropological Association Monograph Series 4, Anchorage, Alaska, pp. 57-79.

McCauley, R.D., J. Fewtrell, A.N. Popper. 2003. High Intensity Anthropogenic Sound Damages Fish Ears. Journal of Acoustical Society of America 113(1):638-642.

McCoy, V.M. and C.R. Burn. 2005. Potential alteration by climate change of the forest-fire regime in the boreal forest of central Yukon Territory. Arctic 58:276-285.

McDonald, L.L., S. Wolfe, P. Jensen, B. Haley, W.J. Wilson, and R.G.B. Senner. 2002. Risk Assessment for a Proposed Spectacled Eider Unusually Sensitive Area (USA), Alaska North Slope. Report Prepared by Western Ecosystems Technology, Inc., Cheyenne, Wyoming, and LGL Alaska Research Associates, Inc., Anchorage, Alaska.

McDonald, M.E., A.E. Hershey, and M.C. Miller. 1996. Global Warming Impacts on Lake Trout in Arctic Lakes. Limnology and Oceanography 41(5):1102-1108.

McDowell Group. 2010. Economic Impact of Alaska's Visitor Industry March 2010, Report prepared for the State of Alaska Department of Commerce.

McElderry, H.I. and P.C. Craig. 1981. A Fish Survey in the Lower Colville River Drainage with an Analysis of Spawning Use by Arctic Cisco. Appendix 2 In Environmental Assessment of the Alaskan Continental Shelf, Final Report of Principal Investigators. Volume 7. U.S. Department of Interior, Bureau of Land Management, and U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado.

McGarigal, K., R.G. Anthony, and F.B. Isaacs. 1991. Interactions of Humans and Bald Eagles on the Columbia River Estuary. Wildlife Monographs 115:1-47.

McGee, C.D. and L.C. Loehr. 2003. An assessment of fecal coliform bacteria in cruise ship wastewater discharge. Oceans 2003 MTS/IEE Conference Report. National Technical Information Service. ADA506773.

McGraw, M. 2008. The degradation of ice wedges in the Colville River Delta and their role in pond drainage. In Kane D.L., Hinkel K.M., eds. Ninth International Conference on Permafrost (p. 1161-1166). Institute of Northern Engineering, University of Alaska Fairbanks (2 Vols).

McKechnie, A.M. and D.N. Gladwin. 1993. Aircraft Overflight Effects on Wildlife Resources. Report No. 290940.22. Prepared by Harris, Miller, Miller, & Hanson, Inc., Lexington, Massachusetts, and Sterna Fuscata, Inc., Fort Collins, Colorado, for U.S. Department of Interior, National Park Service, Denver, Colorado.

McKendrick, J.E. and W. Mitchell. 1978. Fertilizing and Seeding Oil-Damaged Arctic Tundra to Effect Vegetation Recovery, Prudhoe Bay, Alaska. Arctic 31(3):296-304.

________**. 1987.** Plant Succession on Disturbed Sites, North Slope, Alaska. Arctic and Alpine Research 19(4):554-565.

________**. 1996.** Gravel Vegetation Project Report. Fourth Through Sixth Year (1993-1995) Results from Gravel Revegetation Tests on BP Put River No.1 Pad. Prepared by University of Alaska Fairbanks, Alaska, Agricultural and Forestry Experiment Station, Palmer, Alaska, for British Petroleum Exploration – Alaska, Inc., Anchorage Alaska.

________**. 1997.** Recovery and Rehabilitation of Disturbed Wetland Sites. In Proceedings: NPR – A Symposium: Science, Traditional Knowledge, and the Resources of the Northeast Planning Area of the National Petroleum Reserve in Alaska, April 16-18, 1997, Anchorage, Alaska. Outer Continental Shelf Report MMS 97-0013. U.S. Department of Interior, Minerals Management Service and Bureau of Land Management, Anchorage, Alaska.

________**. 2000.** Vegetative Responses to Disturbance. *In* The Natural History of an Arctic Oil Field: Development and the Biota, J.C. Truett and S.R. Johnson (eds.). Academic Press, New York, New York.

________ **and W. Mitchell. 1978.** Fertilizing and Seeding Oil-Damaged Arctic Tundra to Effect Vegetation Recovery, Prudhoe Bay, Alaska. Arctic 31(3):296-304.

________**, P. Scorup, W. Fiscus, and G. Turner. 1992.** Gravel Vegetation Experiments: Alaska North Slope. Agroborealis 24(1):25-32.

McLaren, I.A. 1990. Pinnipeds and oil: ecological perspectives. Pages 55-102 in JR Geraci, DJ St. Aubin, eds. Sea mammals and oil: confronting the risks. Academic Press, San Diego.

McLean, R.F. 1993. North Slope Gravel Pit Performance Guidelines. Technical Report 93-9. Alaska Department of Fish and Game, Habitat and Restoration Division.

________ **and K.J. Delaney. 1977.** A Fish and Wildlife Resource Inventory of Western and Arctic Alaska: Volume 2 - Fisheries. Report by Alaska Department of Fish and Game for Alaska Coastal Management Program, Division of Policy Development and Planning.

McLellan, B.N. 1990. Relationships Between Human Industrial Activity and Grizzly Bears. Pages 57-64 In Eighth International Conference on Bear Research and Management: Bears - Their Biology and Management, February 1989, Victoria, British Columbia, L.M. Darling and Archibald (eds.). International Association for Bear Research and Management, Vancouver, British Columbia.

________ **and D.M. Shackleton. 1989.** Immediate Reactions of Grizzly Bears to Human Activities. Wildlife Society Bulletin 17:269-274.

McNamara, J., D. Kane, and L. Hinzman. 1999. An Analysis of an Arctic Channel Network Using a Digital Elevation Model. Geomorphology 29:339-353.

McNutt, M.; Camilli, R.; Guthrie, G. Hsieh H.; Labson, V.; Lehr, B. Maclay D.; Ratzel, A., and Sogge, M. 2011 Assessment of Flow Rate Estimates for the Deepwater Horizon / Macondo Well Oil Spill Flow Rate Technical Group report to the National Incident Command, Interagency Solutions Group. Washington, DC: U.S. Department of Interior. Available at http://www.doi.gov/deepwaterhorizon/loader.cfm?csModule=security/getfile&PageID=237763.

McPhail, J.D. and C.C. Lindsey. 1970. The Freshwater Fishes of Northwestern Canada and Alaska. Fisheries Research Board of Canada Bulletin 173.

Meador, M.R. and A.O. Layher. 1998. Instream Sand and Gravel Mining. Fisheries 23(11):6-13.

Mecklenburg, C.W., T.A. Mecklenburg, and L.K. Thorsteinson. 2002. Fishes of Alaska. American Fisheries Society, Bethesda, Maryland.

Meier, W.J., J. Stroeve, and F. Fetterer. 2007. Whither Arctic sea ice? A clear signal of decline regionally, seasonally and extending beyond the satellite record. Annals of Glaciology 46:428-434.

Mellor, J.C. 1985. A Statistical Analysis and Summary of Radar-Interpreted Arctic Lake Depths. Bureau of Land Management - Alaska Technical Report 11. U.S. Department of Interior, Bureau of Land Management, Anchorage, Alaska.

________**. 1987.** A Statistical Analysis and Summary of Radar-Interpreted Arctic Lake Depths. Bureau of Land Management - Alaska Technical Report 11. U.S. Department of Interior, Bureau of Land Management, Anchorage, Alaska.

Mel'nikov, V.V., M.Z. Zelensky, and V.V. Bychkov. 1997. Seasonal Migrations and Distribution of Bowhead Whale in Waters of Chukotka. Russian Journal of Marine Biology 23(4):175- 183.

Meltofte, H., T. Piersma, H. Boyd, [and others]. 2007. Effects of climate variation on the breeding ecology of Arctic shorebirds. Meddelelser om Grønland Bioscience 59, Copenhagen, Danish Polar Center, 48 pp.

Meltzer, D.J. 2009. *First Peoples in a New World: Colonizing Ice Age America.* University of California Press.

Melzer D., N. Rice, M.H. Depledge, W.E. Henley, and T.S. Galloway. 2010. Association between Serum Perfluorooctanoic Acid (PFOA) and thyroid disease in the U.S. National Health and Nutrition Examination Survey. Environmental Health Perspectives 118(5) 686–692.

Mendez, J., L.D. Hineman, and D.L. Kane. 1998. Evapotranspiration from a Wetland Complex on the Arctic Coastal Plain of Alaska. Nordic Hydrology 29(4/5):303-330.

Metzner, K.A. 1993. Ecological strategies of wintering Steller's eiders on Izembek Lagoon and Cold Bay, Alaska. M.S. Thesis, University of Missouri, Columbus, MO. 193 pp.

Meyer, M.P. 1995. Executive summary of the U.S. Bureau of Mines investigations in the Colville Mining District, Alaska. Bureau of Mines, Anchorage, AK. 56 p.

Milan, F. 1964. The Acculturation of the Contemporary Eskimo of Wainwright, Alaska. Anthropological Papers of the University of Alaska. 11.

Miller, D.R. 1974. Seasonal changes in the feeding behavior of the barren-ground caribou on the taiga winter range. In: The Behavior of Ungulates and its Relationship to Management, V. Geist and F. Walter, eds. Calgary, Alb., Canada: University of Calgary.

Miller, F.L., A. Gunn, and E. Broughton. 1985. Surplus killing as exemplified by wolf predation on newborn caribou. Canadian Journal Zoology 63(2):295-300.

Miller, G.W., R.E. Elliott, and W.J. Richardson. 1996. Marine Mammal Distribution, Numbers, and Movements. *In* Northstar Marine Mammal Monitoring Program, 1995: Baseline Surveys and Retrospective Analyses of Marine Mammal and Ambient Noise Data From the Central Alaskan Beaufort Sea. LGL Report TA 2101-2. LGL Ecological Research Associates, Inc., Ontario, Canada.

________, Moulton ,V.D., R.A. Davis, M. Holst, P. Millman, A. MacGillivray, and D. Hannay. 2005. Monitoring seismic effects on marine mammals—southeastern Beaufort Sea, 2001–2002. p. 511–542 In: S.L. Armsworthy, P.J. Cranford, and K. Lee (eds.), Offshore Oil and Gas Environmental Effects Monitoring/Approaches and Technologies. Battelle Press, Columbus, OH.

Miller, J. 2010. Personal communication. Scoping e-mail. September 30, 2010.

Miller, M.C., V. Alexander, and R.J. Barsdate. 1978. The Effects of Oil Spills on Phytoplankton in an Arctic Lake and Ponds. Arctic 31(3):192-218.

Miller, M.D., R.T. Prentki, and R.J. Barsdate. 1980. Physics of the Ponds. In Limnology of Tundra Ponds, Barrow, Alaska, J.E. Hobbie (ed.). US/IBP Synthesis Series 13. Dowden, Hutchinson, and Ross, Stroudsburg, Pennsylvania.

Miller, M.W. 1994. Route Selection to Minimize Helicopter Disturbance of Molting Pacific Black Brant: A Simulation. Arctic 47(4):341-349.

Miller, S., S. Schliebe, and K. Proffitt. 2006. Demographics and behavior of polar bears feeding on bowhead whale carcasses at Barter and Cross Islands, Alaska, 2002-2004. OCS Study MMS 2006-14, Mineral Management Service, Anchorage, Alaska. 29 pp.

Miller, S.D. and M.A. Chihuly. 1987. Characteristics of Nonsport Brown Bear Deaths in Alaska. In Seventh International Conference on Bear Research and Management: Bears - Their Biology and Management, February-March, 1986, Williamsburg, Virginia, P. Zager, J. Beecham, G. Matula, and H. Reynolds III (eds.). International Association for Bear Research and Management, Vancouver, British Columbia.

_______, G.C. White, R.A. Sellers, [and others]. 1997. Brown and black bear density estimation in Alaska using radiotelemetry and replicated mark-resight techniques. Wildl. Monogr. 133: 1-55.

Milner, A.M., J.G. Idrons, III, and M.W. Oswood. 1995. The Alaskan Landscape: An Introduction for Limnologists. *In* Freshwaters of Alaska: Ecological Synthesis, A.M. Milner and M.W. Oswood (eds.). Springer-Verlag, New York, New York.

Minnesota Department of Natural Resources (MDNR). 2011. Lakes, rivers, and wetlands facts. Worldwide web address: http://www.dnr.state.mn.us/faq/mnfacts/water.html.

Mizroch, S.A., D.W. Rice, D. Zwiefelhofer, J. Waite, W.L. Perryman. 2009. Distribution and movements of fin whales in the North Pacific Ocean. Mammal Review 39(3)193-227.

MJM Research. 1998. Lakes Sampled for Fish In and Near the Colville River Delta. Report prepared for ARCO Alaska, Inc., Anchorage, Alaska.

_______. 2000a. Fish Utilization of Lakes in Eastern NPR-A - 1999. Report prepared for ARCO Alaska, Inc., Anchorage, Alaska.

_______. 2000b. Fish Utilization of Lakes in Eastern NPR-A: 1999-2000. Report prepared for Phillips Alaska, Inc., Anchorage, Alaska.

_______. 2000c. Fish Occurrence in Lakes of the CD-South Exploration Area. Report prepared for Phillips Alaska, Inc., Anchorage, Alaska.

_______. 2001a. Fish Utilization of Lakes in Eastern NPR-A: 1999-2001. Prepared for Philips Alaska, Inc., Anchorage, Alaska.

_______. 2001b. Fish Utilization of Habitats in the CD-North Exploration Area, 1999-2000. Prepared for Philips Alaska, Inc., Anchorage, Alaska.

_______. 2002a. Baseline Surveys of Fish Habitats in Eastern NPR-A: 2001. Prepared for Philips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

_______. 2002b. Evaluation of Potential Fish Habitat in Lakes in the Grizzly/Heavenly/Supercub Region - 2001. Prepared for Philips Alaska, Inc., Anchorage, Alaska.

________. **2002c.** Fish Habitats in the Colville River Unit Satellites Development CD-North: 1999-2001. Prepared for Philips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2002d.** Fish Habitats in the Colville River Unit Satellites Development CD-South: 1999-2001. Prepared for Philips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2002e.** Fish Habitats in the Colville River Unit Satellites Development CD-South: 2002. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2003a.** Baseline Surveys of Fish Habitats in Eastern NPR-A: 2001-2002. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2003b.** Baseline Surveys of Fish Habitats in Eastern NPR-A, 2003. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2003c.** Fish Utilization of Lakes in the Upper Fish Creek Region of Eastern NPR-A: 2002. Prepared for ConocoPhilips Alaska, Inc., Anchorage.

________. **2003d.** Fish Surveys of Lakes in Association with the Puviaq Exploration Prospect: 2001-2002. Prepared for ConocoPhilips Alaska, Inc., Anchorage.

________. **2003e.** Survey of Lakes in the Placer and Oberon Prospects: 2002. Prepared for ConocoPhilips Alaska, Inc., Anchorage.

________. **2003f.** Fish Survey of Lakes Associated with the Kokoda Exploration Prospect: 2002-2003. Prepared for ConocoPhilips Alaska, Inc., Anchorage.

________. **2003g.** Evaluation of Potential Water Source Lakes in CD-North - 2002. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2004a.** Baseline Surveys of Fish Habitats in Eastern NPR-A, 2001-2003. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2004b.** Survey of Lakes in Association with Kokoda Region Prospects: 2004. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska.

________. **2005a.** Baseline Surveys of Fish Habitats in Eastern NPR-A: 2004. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2005b.** 2005 Survey of Lakes in Support of Alpine Development and Eastern NPR-A Exploration. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2005c.** Survey of Lakes in Association with the Aviullaaviq Prospect - 2005. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska.

________. **2005d.** Survey of Lakes in Association with the Hornet Prospect - 2005. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska.

________. **2005e.** Harvest Estimate and Associated Information for the 2004 Colville River Fall Fishery. Report Prepared for ConocoPhillips Alaska, Inc., Anchorage, AK.

________. **2006a.** 2006 Survey of Lakes in Support of the Makua Exploration Prospect. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2006b.** Survey of Lakes in Association with FEX L.P. Prospects - 2006. Prepared for ASRC Energy Services, Lynx Enterprises, Inc., Anchorage, AK.

________. **2006c.** Harvest Rates for the 2005 Colville River Fall Fishery. Report Prepared for ConocoPhillips Alaska, Inc., Anchorage, AK.

________. **2007a.** Survey of Lakes in Support of CPAI Exploration Prospects - 2007. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2007b.** Monitoring Fish Populations in the Ublutuoch River Drainage in Eastern NPR-A: 2004-2006. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2007c.** Monitoring of Water-Source Lakes in the Alpine Development Project: 1999-2007. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2007d.** Survey of Lakes in Association with Petro-Canada (Alaska) Prospects. Prepared for ASRC Energy Services, Lynx Enterprises, Inc., Anchorage, AK.

________. **2007e.** Distribution and Quantity of Potential Fish Habitat in the NE NPR-A Planning Area. Prepared for North Slope Borough Department of Wildlife Management, Barrow, Alaska.

________. **2007f.** Harvest Rates for the 2006 Colville River Broad Whitefish and Burbot Fisheries. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska.

________. **2008a.** Survey of Lakes in Support of CPAI Exploration Prospects - 2008. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2008b.** Feasibility Study for Estimating Broad Whitefish Production in Tapped Lakes of the Colville Delta. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2008c.** Survey of Lakes in Association with Anadarko Prospects - 2008. Prepared for Anadarko Petroleum Corporation, The Woodlands, Texas.

________. **2009.** Fish Populations in Streams to be Crossed by Proposed Road to the GMT1 Well Pad in Eastern NPR-A: 2009. Prepared for ConocoPhilips Alaska, Inc., Anchorage, Alaska, and Anadarko Petroleum Corporation, The Woodlands, Texas.

Mobilizing Action Toward Community Health (MATCH). 2010a. 2010 Poor Mental Health Days. The Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute: [http://www.countyhealthrankings.org/alaska/north-slope/42]

________. **2010b.** Mobilizing Action Toward Community Health: County Health Rankings. The Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute: [http://www.countyhealthrankings.org/]

Mochanov, Y.A. 1969. The Upper Paleolithic Dyuktai Culture and Several Aspects of its Genesis. *Soviet Archaeology* 4:235-239.

________ **and S.A. Fedoseeva. 1996.** Dyuktai Cave, in *American Beginnings: The Prehistory and Paleoecology of Beringia.* F.H. West ed, University of Chicago Press.

Mocklin, J.A. 2009. Evidence of bowhead whale feeding behavior from aerial photography. AFSC Processed Rep. 2009-06, 118 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

Molenaar, C.M. 1982. Umiat field, an oil accumulation in a thrust-faulted anticline, North Slope of Alaska, in Powers, R.B., ed., Geological studies of the Cordilleran thrust belt: Denver, Colo., Rocky Mountain Association of Geologists, v. 2, p. 537–548.

Moore, S.E. 2000. Variability in cetacean distribution and habitat selection in the Alaskan Arctic, Autumn 1982-91. Arctic 53:448-460.

________ **and R.R. Reeves. 1993.** Distribution and Movement. *In* The Bowhead Whale, J.J. Burns, J.J. Montague, and C.J. Cowles (eds.). Allen Press, Inc., Lawrence, Kansas.

________ **and D.P. DeMaster. 1997.** Cetacean habitats in the Alaskan arctic. Journal of Northwest Atlantic Fishery Science, 22, 55-69.

________**, K.M. Stafford., M.E. Dahlheim, [and others]. 1998.** Seasonal variation in reception of fin whale calls at five geographic areas in the North Pacific. Mar. Mamm. Sci. 14: 617-627.

________**, D.P. DeMaster, and P.K. Dayton. 2000.** Cetacean Habitat Selection in the Alaskan Arctic During Summer and Autumn. Arctic 53(4):432-447.

________ **and J.T. 2002.** Potential Impact of Offshore Human Activities on Gray Whales (*Eschrichtius robustus*). Cetacean Research and Management 4(1):19-25.

________**, J.M. Grebmeier, and J.R. Davies. 2003.** Gray whale distribution relative to forage habitat in the northern Bering Sea: current conditions and retrospective summary. Canadian Journal of Zoology/Revue Canadienne de Zoologie 81:734-742.

________**, K.M. Stafford, D.K. Mellinger, and J.A. Hildebrand. 2006.** Listening for large whales in the offshore waters of Alaska. Ecological Applications 16:932–944.

________ **and H.P. Huntington. 2008.** Arctic Marine Mammals and Climate Change: Impacts and Resilience. Ecological Applications 18(2), Supplement: Arctic Marine Mammals and Climate Change, pp. S157-S165.

________, **J.C. George, G. Sheffield, J. Bacon, C.J. Ashjian. 2010.** Bowhead whale distribution and feeding near Barrow, Alaska, in late summer 2005-06. Arctic 63(2):195-205

Moore, T.E., W.K. Wallace, K.J. Bird, S.M. Karl, C.G. Mull, and J.T. Dillon. 1994. The Geology of Northern Alaska. In: The Geology of Alaska, G. Plafker and H.C Berg, eds. The Geology of North America G-1. The Geological Society of America, pp. 49-140.

Morris, B.F. 1981. Living Marine Resources of the Chukchi Sea: A Resource Report for the Chukchi Sea Oil and Gas Lease Sale Number 85. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Technical Memorandum NMFS F/AKR-3.

Morris, W.A. 2000. Seasonal Movements of Broad Whitefish in the Freshwater Systems of the Prudhoe Bay Oil Field. Master's Thesis. Fairbanks, AK: University of Alaska.

________. **2003.** Seasonal Movements and Habitat Use of Arctic Grayling (*Thymallus arcticus*), Burbot (*Lota lota*), and Broad Whitefish (*Coregonus nasus*) within the Fish Creek Drainage of the National Petroleum Reserve – Alaska, 2001-2002. Alaska Department of Natural Resources, Office of Habitat Management and Permitting, Technical Report No. 03-02.

________ **and J. Winters. 2004.** Evaluation of Stream Crossing Structures for Providing Fish Passage in a Tundra Stream; Fish Sampling of Fawn Creek, Prudhoe Bay, Alaska, 2004. Technical Report No. 04-05. Alaska Department of Natural Resources, Office of Habitat Management and Permitting.

________. **2005.** Fish Behavioral and Physical Responses to Vibroseis Noise, Prudhoe Bay, Alaska 2003. Technical Report No. 05-02. Alaska Department of Natural Resources, Office of Habitat and Permitting.

________, **L.L. Moulton, J. Bacon, J.R. Rose, and M.S. Whitman. 2006.** Seasonal Movements and Habitat Use by Broad Whitefish (*Coregonus nasus*) in the Teshekpuk Lake Region of the National Petroleum Reserve - Alaska, 2003-2005. Alaska Department of Natural Resources, Office of Habitat Management and Permitting, Technical Report No. 06-04.

________ **and J.F. Winters. 2007.** A Survey of Stream Crossing Structures in the North Slope Oilfields. Technical Report No. 07-01. Alaska Department of Natural Resources, Office of Habitat Management and Permitting.

Morrissey, L.A. and R.A. Ennis. 1981. Vegetation Mapping of the National Petroleum Reserve in Alaska Using Landsat Digital Data. Open-File Report 81-315. Reston, VA: U.S. Geological Survey.

Morrison, R.I.G., B.J. McCaffery, R.E. Gill, [and others]. 2006. Population estimates of North American shorebirds, 2006. Wader Study Group Bull. 111, pp. 67-85.

Morrison, W. 1997. Personal Communication. Telephone conversation on May 2, 1997, between W. Morrison, Chief, Kuparuk Camp Services, ARCO Alaska and J. Tremont, Geographer, U.S. Department of the Interior, Mineral Management Service, Alaska Outer Continental Shelf Region; Subject: Air ports at Prudhoe Bay, cited in USDOI BLM and MMS, 1998.

Morrow, J.E. 1980. The Freshwater Fishes of Alaska. Alaska Northwest Publishing Company, Anchorage, Alaska.

Mosbech, A. and C. Glahder. 1991. Assessment of the impact of helicopter disturbance on moulting pink-footed geese *Anser brachyrhynchus* and barnacle geese *Branta leucopsis* in Jameson Land, Greenland. Ardea 79:233-238.

Moscrip, A.L. and D.R. Montgomery. 1997. Urbanization, Flood Frequency, and Salmon Abundance in Puget Lowland Streams. Journal of the American Water Resources Association 33(6):1289-1297.

Moses S.K., A.V. Whiting, G.R. Bratton, R.J. Taylor, T.M. OíHara 2009. Inorganic nutrients and contaminants in subsistence species of Alaska: linking wildlife and human health. International journal of circumpolar health. 68(1):53.

Mosier, D.L. and J.D. Bliss. 1992, Introduction and overview of mineral deposit modeling, in Bliss, J.D., ed., Developments in mineral deposit modeling: U.S. Geological Survey Bulletin 2004, p. 1-5.

Moss, J.H., J.M. Murphy, E.V. Farley, L.B. Eisner, and A.G. Andrews. 2009. Juvenile Pink and Chum Salmon Distribution, Diet, and Growth in the Northern Bering and Chukchi seas. North Pacific Anadromous Fish Commission Bulletin 5: 191–196.

Mould, E. 1979. Seasonal movement related to habitat of moose along the Colville River, Alaska. Murrelet 60:6-11.

Moulton, L.L. and C.B. Dew. 1983. Fish Utilization of Tundra Streams Between the Colville and Kuparuk Rivers. Report for ARCO Alaska, Inc.

________**. 1997.** The 1996 Colville Delta Fish Habitat Survey. Report prepared for ARCO Alaska, Inc., Anchorage, Alaska.

________**. 1998.** Lakes Sampled for Fish within and near the Colville River Delta, Alaska 1979-1998. Report prepared by MJM Research, Bainbridge, Washington, for ARCO Alaska, Inc.

________**. 2007.** Personal Communication. Electronic Mail on January 31, 2007; Subject: 2006 Arctic cisco harvest rates.

________**. 2010.** Personal Communication: threespine stickleback captures in the NPR-A. Electronic mail correspondence on October 22, 2010.

________ **and M.H. Fawcett. 1984.** Oliktok Point Fish Studies, 1983. Report Prepared by Woodward-Clyde Consultants for ARCO Alaska, Inc., Anchorage, Alaska.

________, B.J. Gallaway, M. H. Fawcett, K.R. Griffiths, R.G. Critchlow, R.G. Fechhelm, D.R. Schmidt, and J.S. Baker. 1986. 1984 Central Beaufort Sea Fish Study. Waterflood Monitoring Program Fish Study. Report prepared by Entrix, Inc., LGL Ecological Research Associates, Inc., and Woodward-Clyde Consultants for the U.S. Army Corps of Engineers, Alaska District, Anchorage, Alaska.

________ and K.E. Tarbox. 1987. Analysis of Arctic Cod Movements in the Beaufort Sea Nearshore Region, 1978-79. Arctic 40:43-49.

________, W.A. Morris, C. George, J. Bacon, J.R. Rose, and M.S. Whitman. 2007. Surveys of Fish Habitats in the Teshekpuk Lake Region, 2003-2005. Report to the North Slope Borough Department of Wildlife Management, Barrow, Alaska.

________, M.S. Whitman, W.A. Morris, J.C. George, J. Bacon, and J.R. Rose. 2010a. Surveys of Fish in the Teshekpuk Lake Region during 2006-2007, with Comparisons to Previous Sampling. Prepared by MJM Research, LLC, Bureau of Land Management Arctic Field Office, Alaska Department of Fish and Game Division of Habitat, and ABR., Inc. for North Slope Borough Department of Wildlife Management, Barrow, AK.

________, B. Seavey, and J. Pausanna. 2010b. History of an Under-Ice Subsistence Fishery for Arctic Cisco and Least Cisco in the Colville River, Alaska. Arctic 63(4):381-390.

Moulton, V.D. and J.W. Lawson. 2002. Seals, 2001. p. 3-1 to 3-48 *In*: W.J. Richardson (ed.), Marine mammal and acoustical monitoring of WesternGeco's open water seismic program in the Alaskan Beaufort Sea, 2001. Rep. from LGL Ltd., King City, Ont., and Greeneridge Sciences Inc., Santa Barbara, CA, for WesternGeco, Houston, TX, and National Marine Fisheries Service, Anchorage, AK, and Silver Spring, MD. LGL Rep. TA2564-4.

________, W.J. Richardson, and M.T. Williams. 2003. Ringed seal densities and noise near an icebound artificial island with construction and drilling. Acoustics Research Letters Online. 4(4): 112-117.

________, W.J. Richardson., R.E. Elliott, T.L. McDonald, C. Nations, and M.T. Williams. 2005. Effects of an offshore oil development on local abundance and distribution of ringed seals (*Phoca hispida*) of the Alaskan Beaufort Sea. Mar. Mamm. Sci. 21(2):217-242.

Mowbray, T.B., F. Cooke, and B. Ganter. 2000. Snow Goose (*Chen caerulescens*). *In* The Birds of North America, No. 514 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Mueller, K. 1997. Telephone conversation between Caryn Smith, USDOI MMS Alaska OCS Region, to Keith Mueller, U.S. Fish and Wildlife Service, Fairbanks Office; subject: area of oil-misted tundra from spill DS 5-23.

Muller, S.V., A.E. Racoviteanu, and D.A. Walker. 1999. Landsat-MSS derived land-cover map of northern Alaska: extrapolation methods and a comparison with photo-interpreted and AVHRR-derived maps. Int. J. Remote Sens. 20:2921-2946.

_______, D.A. Walker, F.E. Nelson, N.A. Auerbach, J.G. Bockheim, S. Guyer and D. Sherba. 1998. Accuracy assessment of a land-cover map of the Kuparuk River basin, Alaska: considerations for remote regions. Photo. Eng. and Remote Sens. 64:619-628.

Murdoch, J. 1892. Ethnological Results of the Point Barrow Expedition. In: 9th Annual Report of the Bureau of American Ethnology for the Years 1887-1888, Washington D.C. Reprinted by the Smithsonian Institution Press, Washington, DC.

Murphy, E., A.L. Kinmonth, T. Marteau. 1992. General practice based diabetes surveillance: the views of patients. Br J Gen Pract 42: 279-283.

Murphy N.J., C.D. Schraer, M.C. Thiele, E.J. Boyko, L.R. Bulkow, B.J. Doty, A.P. Lanier. 1995. Dietary change and Obesity Associated with Glucose Intolerance in Alaska Natives. Journal of the American Dietetic Association 95(6).

_______, C. Schraer, M. Thiele, E. Boyko, L. Bulkow, B. Doty, A.P. Lanier. 1997. Hypertension in Alaska Natives: association with overweight, glucose intolerance, and mechanized activity. Ethnicity and Health 1997: 267–275

Murphy, S.M. and J.A. Curatolo. 1984. Responses of Caribou to Ramps and Pipelines in the West End of the Kuparuk Oilfield, Alaska, 1983. Final Report. ARCO Alaska, Inc., Anchorage, Alaska.

_______, B.A. Anderson, C.L. Cranor, and C.B. Johnson. 1988. Lisburne Terrestrial Monitoring Program - 1987: The Effects of the Lisburne Development Project on Geese and Swans. Report Prepared by ABR, Inc., Fairbanks, Alaska, for ARCO Alaska, Inc., Anchorage, Alaska.

_______ and B.A. Anderson. 1993. Lisburne Terrestrial Monitoring Program, the Effects of the Lisburne Development Project on Geese and Swans, 1985-1989. Report Prepared by ABR, Inc., for ARCO Alaska, Inc., Anchorage, Alaska.

_______ and B.E. Lawhead. 2000. Caribou. In The Natural History of an Arctic Oil Field: Development and the Biota, J.C. Truett and S.R. Johnson (eds.). Academic Press, San Diego, California.

_______, F.J. Mueter, and S.R. Braund. 2007. Variation in the Abundance of Arctic Cisco in the Colville River: Analysis of Existing Data and Local Knowledge. Prepared by ABR, Inc.-Environmental Research and Services, Sigma Plus Statistical Consulting Services, Stephen R. Braund and Associates, and Kuukpik Subsistence Oversight Panel, Inc. Prepared for U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Environmental Studies Section, Anchorage, AK.

Myers, G. 1949. Usage of Anadromous, Catadromous, and Allied Terms for Migratory Fishes. Copeia 1949:89-96.

Myers, J.P. 1981. A test of three hypotheses for latitudinal segregation of the sexes in wintering birds. Can. J. Zool. 59: 1527–1534.

Nadelhoffer, K.J., A.E. Giblin, G.R. Shaver, and J.A. Laundre. 1991. Effects of temperature and substrate quality on elemental mineralization in six arctic soils. Ecology 72:242-253.

Nageak, B. 2010. Stacey Fritz interviewed BLM's Barrow Field Office Natural Resource Specialist Ben Nageak by telephone in November, 2010.

Naito, A.T. and D.M. Cairns. 2011. Relationships between arctic shrub dynamics and topographically derived hydrologic characteristics. Environ. Res. Lett. 6:045506 (8 pp).

Napageak, T. 1990. Scoping Testimony. Public Hearing Official Transcript of Proceedings, Alaska Outer Continental Shelf, Beaufort Sea Planning Area Oil and Gas Lease Sale 124, Draft Environmental Impact Statement. U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Nuiqsut, Alaska

Narasimhan, B., R. Srinivasan, S.T. Bednarz, M.R. Ernst, and P.M. Allen. 2010. A Comprehensive Modeling Approach for Reservoir Water Quality Assessment and Management due to Point and Nonpoint Source Pollution. Transactions of the American Society of Agricultural and Biological Engineers 53(5):1605-1617.

Nash, R.F. 2001. "Wilderness and The American Mind", Yale University Press publications.

National Academy of Sciences. 2006. Understanding and Responding to Climate Change: Highlights of National Academies Reports. Division on Earth and Life Studies, National Academy of Sciences, Washington, District of Columbia. Available online at: http://dels.nas.edu/basc/Climate-HIGH.pdf

National Atmospheric Deposition Program (NADP). 2010. Data available online at: http://nadp.sws.uiuc.edu/

National Center for Chronic Disease Prevention and Health Promotion (CDC). 2004, 2006, 2007, 2008, 2009. Behavioral Risk Factor Surveillance System (BRFSS): Prevalence and Trends Data Alaska 2008: [http://apps.nccd.cdc.gov/brfss/index.asp]

National Coalition of STD Directors (NCSTDD). 2005. STDs in Alaska Natives. JSI Research and Training Institute and the Northern Plains Tribal Epidemiology Center.

National Hydrography Dataset (NHD). 2007. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency, USDA Forest Service, and other Federal, State and local partners.

National Marine Fisheries Service (NMFS). 1991. Final Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). USDOC, National Marine Fisheries Service.

________. **2002.** Biological Opinion, Endangered Species Act-Section 7 Consultation and Operation of the Liberty Oil Production Island. Consultation Number F/AKR/2001/00889. Anchorage, Alaska. [http://www.fakr.noaa.gov/protectedresources/whales/bowhead/biop.pdf]

________. **2005.** Final Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska. U.S. DOC, National Marine Fisheries Service, Alaska Region.

________. **2008.** Endangered Species Act-Section 7 Consultation. Biological Opinion on Oil and Gas Leasing and Exploration Activities in the U.S. Beaufort and Chukchi Seas, Alaska; and Authorization of Small Takes Under the Marine Mammal Protection Act. National Marine Fisheries Service, Alaska Region.

________. **2011.** Impacts to Essential Fish Habitat from Non-fishing Activities in Alaska. Public Review Draft, February 2011. National Marine Fisheries Service, Alaska Region.

________. **2011.** Effects of Oil and Gas Activities in the Arctic Draft Environmental Impact Statement. NOAA Fisheries. Office of Protected Resources. December 2011.

National Marine Mammal Laboratory. 2009. Bowhead whale feeding ecology study (BOWFEST) in the western Beaufort Sea 2009. Annual Report project provided to: Environmental Studies Program, Alaska Outer Continental Shelf Region, Minerals Management Service, 94 East 36th Avenue, 3rd Floor, Anchorage, Alaska 99508-4363. Submitted through: Alaska Fisheries Science Center, F/AKC47600 Sand Point Way, NE, Seattle WA 98115-0070. 63 pp.

________. **2010.** Bowhead whale feeding ecology study (BOWFEST) in the western Beaufort Sea, Bowhead Whale 2009 Annual Report. Alaska Fisheries Science Center, F/AKC4, 7600 Sand Point Way, NE, Seattle WA 98115-0070.

National Research Council (NRC). 1999. The Community Development Quota Program in Alaska. Committee to Review the Community Development Quota Program, Ocean Studies Board, Commission on Geosciences, Environment, and Resources. National Academy Press, Washington, D.C.

________. **2003.** Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope. Committee on Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope, Board of Environmental Studies and Toxicology, Polar Research Board, Division of Earth and Life Studies. The National Academies Press, Washington, D.C. Available at: http://www.nap.edu/openbook/0309087376/html/1.html

________. **2003a.** "Front Matter." Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope. Washington, DC: The National Academies Press, 1. Print.

________. **2008.** *Minerals, Critical Minerals, and the U.S. Economy* . Washington, DC: The National Academies Press.

Nawa, R.K. and C.A. Frissel. 1993. Measuring Scour and Fill of Gravel Streambeds with Scour Chains and Sliding-bead Monitors. North American Journal of Fisheries Management 13:634-639.

Nellemann, C. and R.D. Cameron. 1996. Effects of Petroleum Development on Terrain Preferences of Calving Caribou. Arctic 491:23-28.

Nelson, C. H. and K.R. Johnson. 1987. Whales and walruses as tillers of the sea floor. Scientific American 256:112-117.

_____, R.L. Philips, J. McRae, Jr., J.H. Barber Jr., M.W. McLaughlin, and J.L. Chin. 1994. Gray whale and Pacific walrus benthic feeding grounds and sea floor interaction in the Chukchi Sea. U.S. Geological Survey, Menlo Park, CA, Technical Report for Minerals Management Service/ IA NO. 14157, OCS Study MMS93-0042, 51 p.

Nelson, E.W. 1887. Birds of Alaska, with a partial bibliography of Alaskan ornithology. Government Printing Office, Washington D. C.

Nelson, R.K. 1969. Hunters of the Northern Ice. The University of Chicago Press, Chicago.

_____. 1981. Harvest of the Sea: Coastal Subsistence in Modern Wainwright. A Report for the North Slope Borough's Coastal Management Program.

Nelson, U.C. 1953. Cliff-nesting Canada geese on the arctic slope of Alaska. Journal of Wildlife Management 17:536.

Nemoto T. 1957. Foods of baleen whales in the northern Pacific. Scientific Reports of the Whales Research Institute, Tokyo 12:33-89.

_____. 1959. Foods of baleen whales with reference to whale movements. Scientific Reports of the Whales Research Institute, Tokyo 14:244-290.

_____. 1970. Feeding pattern of baleen whales in the oceans, pp. 241-252 in Marine food chains, ed. J.H. Steele. Univ. of California Press, Berkeley.

Nerini, M.K., H.W. Braham, W.M. Marquette, and D.J. Rugh. 1984. Life history of the bowhead whale, *Balaena mysticetus* (Mammalia: Cetacea). Journal of Zoology, London 204: 443-468.

Netsch, N., E. Crateau, G. Love, and N. Swanton. 1977. Preliminary Report - Freshwater Fisheries Reconnaissance of the Coastal Plain of the National Petroleum Reserve - Alaska (NPR-A), July and August 1977. U.S. Fish and Wildlife Service, Anchorage, AK.

Newbury, T.K. 1983. Under Landfast Ice. Arctic 36:328-340.

Nigro, D.A. and R.J. Ritchie. 2003. Colville River Cliff-Nesting Raptor Survey. Unpublished report Bureau of Land Management, Fairbanks, AK. 11pp.

Niles, L.J., H.P. Sitters, A.D. Dey, [and others]. 2008. Status of the Red Knot, *Calidris canutus rufa*, in the Western Hemisphere. Studies Avian Biol. 36: 1–185.

Nobmann, E., R. Ponce, C. Mattil, [and others]. 2005. Dietary Intakes Vary with Age Among Eskimo Adults of Northwest Alaska in the GOCADAN Study 2000-2003. The Journal of Nutrition 135: 856-862.

Noel, L.E., C.T. Schick, and S.R. Johnson. 1996. Quantification of Habitat Alterations and Bird Use of Impoundments in the Prudhoe Bay Oil Field, Alaska, 1994. Report Prepared by LGL Alaska Research Associates, Inc., for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

_______, R.H. Pollard, W.B. Ballard, and M.A. Cronin. 1998. Activity and use of active gravel pads and tundra by caribou, *Rangifer tarandus granti*, within the Prudhoe Bay Oil Field, Alaska. Canadian Field Naturalist 112:400-409.

_______. 1999. Calving caribou distribution in the Teshekpuk Lake Area, June 1998. Final Report Prepared by LGL Alaska Research Associates, Inc., for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

_______ and T.L. Olson. 1999a. Caribou distribution in the Milne Point Study Area, summer 1998. Final Report. Prepared by LGL Alaska Research Associates for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

_______. 1999b. Bullen Point to Staines River large mammal distribution, summer 1998. Final Report. Prepared by LGL Alaska Research Associates for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

_______. 2000. Calving caribou distribution in the Teshekpuk Lake Area, June 1999. Final Report. Prepared by LGL Alaska Research Associates, Inc., for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

_______, R.J. Rodrigues, and S.R. Johnson. 2001. Nesting status of the common eider and other barrier island nesting birds in the central Alaskan Beaufort Sea, summer 2000. Report for BP Exploration (Alaska) Inc., by LGL Alaska Research Associates, Anchorage, Alaska 34 p +Append.

_______, G.M. O'Doherty, and S.R. Johnson. 2002. Nesting Status of the Common Eider and the Glaucous Gull in the Central Alaskan Beaufort Sea 2002. Prepared by LGL Alaska Research Associates, Inc., for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

_______ and J.C. George. 2003. Caribou distribution during calving in the northeast National Petroleum Reserve-Alaska, June 1998 to 2000. Rangifer Special Issue No. 14: 283-291.

_______, S.R. Johnson, and W.J. Gazey. 2006. Oilfield Development and Glaucous Gull (*Larus hyperboreus*) Distribution and Abundance in Central Alaskan Beaufort Sea Lagoons, 1970–2001. Arctic 59(1):65-78.

Nokleberg, W.J., T.K Bundtzen, H.C. Berg, [and others]. 1987. Significant metalliferous lode deposits and placer districts of Alaska: U.S. Geological Survey Bulletin 1786, 104 p., 2 plates, map scale 1:5,000,000.

_______, **T.K. Bundtzen, H.C. Berg, [and others]. 1994.** Metallogenic map of significant metalliferous lode deposits and placer districts in Alaska, in Plafker, G. and Berg, H.C., eds., The geology of north America - The geology of Alaska: The Geological Society of America, Boulder, CO., vol. G-1, plate 11, scale 1:2,500,000.

Noongwook, G. 2007. The Native Village of Savoonga, The Native Village of Gambell, Huntington, H.P. and George, J.C. Traditional knowledge of the Bowhead Whale (*Balaena mysticetus*) around St. Lawrence Island, Alaska. Arctic 60:47-54.

NORCOR Engineering and Research. 1975. The Interaction of Crude Oil with Arctic Sea Ice. Beaufort Sea Technical Report No. 27. Department of the Environment, Beaufort Sea Project, Victoria, British Columbia.

Norman, S.A. 2011. Nonlethal anthropogenic and environmental stressors in Cook Inlet beluga whales (*Delphinapterus leucas*). Report prepared for NOAA Fisheries, National Marine Fisheries Service, Anchorage, Alaska. NMFS contract no. HA133F-10-SE-3639. 113 p.

North, M.R. 1994. Yellow-billed Loon (*Gavia adamsii*). In The Birds of North America, No. 121 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

North American Indians. Smithsonian Institution, Washington, DC.

North Pacific Fishery Management Council (NPFMC). 1990. Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska. Prepared by Salmon Plan Team, North Pacific Fishery Management Council, and National Marine Fisheries Service, Alaska Region, Anchorage.

_______. **2006.** Amendments 7 and 8 to the Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service - Alaska Region, North Pacific Fishery Management Council, Anchorage, AK.

_______. **2009.** Fishery Management Plan for Fish Resources of the Arctic Management Area. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service - Alaska Region, North Pacific Fishery Management Council, Anchorage, AK.

North Slope Borough (NSB). 1998. Economic Profile and Census Report, Barrow, Alaska.

_______. **2001, 2009, 2010.** Comprehensive Annual Financial Report of the North Slope Borough, Alaska [multiple years]. http://www.north-slope.org/departments/adminfinance/FinancialReport.php

_______. **2003.** Unpublished Data. North Slope Borough, Department of Wildlife Management, Barrow, Alaska.

______. **2004.** Letter Dated August 23, 2004, Regarding Comments on the Draft Amended Integrated Activity Plan and Environmental Impact Statement for the Northeast Planning Area of the National Petroleum Reserve in Alaska, North Slope Borough, Alaska.

______. **2006.** Northern Alaska Subsistence Food Research Contaminant and Nutrient Ecology in Coastal Marine Mammals and Fish. Barrow, Alaska: North Slope Borough Department of Wildlife Management, P.O. Box 69 Barrow AK 99723.

______. **2007.** Traditional Knowledge Workshop, North Slope Borough Oil and Gas Plan, Anchorage, Alaska, September 6, 2007. Draft Report, December 2007. URS Corporation, Anchorage, AK.

______. **2011.** Approved Budget 2011. http://www.north-slope.org/

North Slope Borough Contract Staff. 1979. Native Livelihood and Dependence: A Study of Land Use Values Through Time. National Petroleum Reserve in Alaska 105(c) Field Study 1 pp. 166. U.S. Department of the Interior, Anchorage, Alaska.

North Slope Borough Fire Department. 2010. Fire Department Mission. Barrow, Alaska.

Northwest Arctic Borough. 2010. Public Services. [http://nwabor.org/publicservices.html]

Northcott, P.L. 1984. Impact of the Upper Salmon Hydroelectric Development on the Grey River Herd. In Abstracts of the Second North American Caribou Workshop, October 17-20, 1984, Montreal, Quebec, T. Merdith (chair). McGill University, Montreal, Quebec.

Northern Economics Inc. and the Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage. 2009. Economic Analysis of Future Offshore Oil and Gas Development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin; Prepared by for Shell Exploration and Production. Anchorage, Alaska. March 2009.

Nowacki G., P. Spencer, M. Fleming, T. Brock, and T. Jorgenson. 2001. Unified Ecoregions of Alaska: 2001. Open File Report 02-297. U.S. Geological Survey, Anchorage, Alaska.

Nuka Research and Planning Group. 2010. Alaska North Slope Spills Analysis. Prepared for State of Alaska, Department of Environmental Conservation Anchorage, AK: State of Alaska, Department of Environmental Conservation; 244 pp.

Nukapigak, E. 2011. Personal communication. BLM Arctic Field Office anthropologist Stacey Fritz spoke with Edward Nukapigak of Nuiqsut by telephone in February 2011.

Nukapigak, I. 2012. Comments on Draft Integrated Activity Plan/Environmental Impact Statement for the National Petroleum Reserve in Alaska (letter submitted on belalf of the Kuukpik Corporation and its shareholders and constituents in Nuiqsut, the Native Village of Nuiqsut, the City of Nuiqsut, and individual signers) Anchorage, Alaska.

Nyland, D.L. 2002. Water Column Pressures Induced by Vibrators Operating on Floating Ice. WesternGeco, Anchorage, AK.

OASIS Environmental, Inc. and LCMF, LLC. 2006. National Petroleum Reserve Alaska 2006 Lake Surveys. Report Prepared for ConocoPhillips Alaska, Inc., Anchorage, Alaska.

O'Brien, W.J., M. Bahr, A.E. Hershey, [and others]. 1995. The Limnology of Toolik Lake. *In* Freshwaters of Alaska: Ecological Synthesis, A.M. Milner and M.W. Oswood (eds.). Springer-Verlag, New York, New York.

Obritschkewitsch, T., P.D. Martin, and R.S. Suydam. 2001. Breeding biology of Steller's eiders nesting near Barrow, Alaska, 1999-2000. U.S. Fish and Wildlife Service, Northern Alaska Ecological Services, Fairbanks, Alaska. Technical Report NAES-TR-01-04. 113 pp.

________ **and R.J. Ritchie. 2008.** Steller's eider surveys near Barrow, Alaska, 2007. ABR, Inc. Fairbanks, Alaska. 23 pp.

O'Corry-Crowe, G.M., R.S. Suydam, A. Rosenberg, K.J. Frost, and A.E. Dizon. 1997. Phylogeography, population structure and dispersal patterns of the beluga whale *Delphinapterus leucas* in the western Nearctic revealed by mitochondrial DNA. Mol. Ecol. 6:955-970.

________**, A.E. Dizon, R.S. Suydam, and L.F. Lowry. 2002.** Molecular genetic studies of population structure and movement patterns in a migratory species: the beluga whale (*Delphinapterus leucas*) in the western Nearctic. Pages 53-64. *In*: C.J. Pfeiffer (ed.), Molecular and cell biology of marine mammals. Krieger Press, Florida.

Oechel, W.C., Vourlitis, G.L., Hastings, S.J., S.J., Zulueta, R.C., Hinzman, L. and Kane, D. 2000. Acclimation of Ecosystem CO2 Exchange in the Alaskan Arctic in Response to Decadal Climate Warming. Nature 406: 978-981.

OGP (International Association of Oil & Gas Producers). 2010. OGP Risk Assessment Data Dictionary, Blowout Frequencies. Report No. 434-2. United Kingdom, OGP. 20 pp. http://www.ogp.org.uk/pubs/434-02.pdf

Okada, M. 2010. The Comparison of Qualitative and Quantitative Approaches for Measuring Traditional Food Sharing in Communities on the North Slope of Alaska, Department of Resources Management. University of Alaska, Fairbanks.

Okkonen S.R., C.J. Ashjian, R.G. Campbell, J.T. Clarke, S.E. Moore, and K.D. Taylor. 2011. Satellite observations of circulation features associated with a bowhead whale feeding 'hotspot' near Barrow, Alaska. Remote Sensing of Environment 115: 2168-2174.

Oliver, J.S., P.N. Slattery, E.F. O'Connor, and L.F. Lowry. 1983. Walrus, *Odobenus rosmarus*, feeding in the Bering Sea – A benthic perspective. Fishery Bulletin 81:501-512.

Olson, C.M. 1999. Nutrition and health outcomes associated with food insecurity and hunger. J Nutr 129(2S Suppl): 521S-524S.

Olson, T.L. and B.K. Gilbert. 1994. Variable Impacts of People on Brown Bear Use of an Alaskan River. In Ninth International Conference on Bear Research and Management, February 1992, Missoula, Montana, J.J. Claar and P. Schullery (eds.). International Association for Bear Research and Management, Vancouver, British Columbia.

_______ **and L.E. Noel. 2000.** Caribou distribution in the Milne Point Study Area, summer 1999. Final Report. Prepared by LGL Alaska Research Associates, Inc., for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

Oritsland, N.A., F.R. Engelhardt, F.A. Juck, R.J. Hurst, and P.D. Watts. 1981. Effects of Crude Oil on Polar Bears. Environmental Study No. 24. Canadian Department of Northern Affairs, Ottawa, Ontario.

Orris, G.J. and J.D. Bliss. 1991, Some industrial mineral deposit models - Descriptive deposit models: U.S. Geological Survey Open-File Report 91-0011-A, 73 p.

Osterkamp, T.E. 2005. The Recent Warming of Permafrost in Alaska: Global Planet. Change 49:187-202.

_______**. 2007.** Characteristics of the Recent Warming of Permafrost in Alaska. Journal of Geophysical Research 112: 10.1029/2006JF000578.

Ostro, B., R. Broadwin, S. Green, W.Y. Fang, and M. Lipsett. 2006. Fine Particulate Air Pollution in Nine California Counties: Results from CALFINE. Environmental Health Perspectives. 2006: 114: 29-33.

Oswood, M.W., J.B. Reynolds, J.G. Irons, III, and A.M. Milner. 2000. Distributions of Freshwater Fishes in Ecoregions and Hydroregions of Alaska. Journal of the North American Benthological Society 19(3):405-418.

Ott, A.G. 1997. Letter Dated August 20, 1997 to Johanna Munson, State NPR – A Representative, from A.G. Ott, Regional Supervisor, Alaska Department of Fish and Game, Habitat and Restoration Division.

Overpeck, J., K. Hughen, D. Hardy, [and others]. 1997. Arctic environmental change of the last four centuries. Science 278: 1251-1256.

Overstreet, R. and J.A. Galt. 1995. Physical Processes Affecting the Movement and Spreading of Oils in Inland Waters. HAZMAT Report 95-7. U.S. Environmental Protection Agency, Region 5, Chicago, Illinois.

Ovsyanikov, N.G., L.L. Bove, and A.A. Kochnev. 1994. Causes of mass mortality of walruses on coastal haulouts. Zoologichesky Zhurnal. 73:80-87.

Pacific Meridian Resources. 1996. National Petroleum Reserve – Alaska Landcover Inventory: Phase 2, Eastern NPR – A. Interim Report PMR Job Number 401. Pacific Meridian Resources, Sacramento, California.

Page, G.W., L.E. Stenzel, and J.E. Kjelmyr. 1999. Overview of shorebird abundance and distribution in wetlands of the Pacific coast of the contiguous United States. Condor 101: 461-471

Palmer, A.G., D.L. Nordmeyer, D.D. Roby. 2001. Factors influencing nest attendance and time-activity budgets of peregrine falcons in Interior Alaska. Arctic 54:105-114.

Pamperin, N.J. 2008. Winter movements of Arctic Foxes in Northern Alaska measured by satellite telemetry. M.S. Thesis. University of Alaska, Fairbanks. ix + 68 pp.

Paneak, S. 1990. We Live to Hunt, Reprinted by the North Slope Borough Planning Department, Barrow, Alaska, from Alaska Magazine, March 1960. With permission from his widow, Susie Paneak.

Parkinson A.J., B.D. Gold, L. Bulkow, R.B. Wainwright, B. Swaminathan, B. Khanna, K.M. Petersen, and M. Fitzgerald. 2000. High Prevalence of Helicobacter pylori in the Alaska Native Population and Association with Low Serum Ferritin Levels in Young Adults. Clin Diagn Lab Immunol. 7(6): 885-888.

________ **and J.C. Butler. 2005**. Potential impacts of climate change on infectious diseases in the Arctic. International journal of circumpolar health. 64(5):478-486.

________. **2006.** Testimony on the Arctic Human Health Initiative. U. S. Department of Health and Human Services: [http://www.hhs.gov/asl/testify/t060926.html]

Parmelee, D.F. 1992. Snowy Owl (*Bubo scandiacus*), The Birds of North America Online (A. Poole, ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/010 doi:10.2173/bna.10

Parnell, S., B. Hogan, and W. Hurlburt. 2008. Health Risks in Alaska Among Adults: Alaska Behavioral Risk Factor Survey 2008 Annual Report. Behavioral Risk Factor Surveillance. State of Alaska, Department of Health and Social Services, Juneau, Alaska.

Parrett, L. 2009. Unit 26A, Teshekpuk caribou herd. Pages 271-298 in P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0 Juneau, Alaska, USA.

________**, S. Pedersen, J. Dau, G. Carroll, B. Person, A. Prichard, and D. Yokel. 2009.** Development of a GIS-based method to refine annual herd-specific caribou harvest estimates from Barrow, Alaska, using 2003-2007 caribou harvest and satellite telemetry data. Poster presented at CARMA 6 Workshop, 4-6 December 2009, Vancouver, B.C.

________. **2010.** Personal communication. April 28, 2010.

________. **2010.** Personal communication. October 4, 2010.

Patenaude M.J., W.J. Richardson, M.A. Smultea, W.R. Koski, G.W. Miller, B. Würsig, and C.R. Greene. 2002. Aircraft sound and disturbance to bowhead and beluga whales during spring migration in the Alaskan Beaufort Sea. Marine Mammal Science 18(2):309-335.

Patten, S.M. and L.R. Patten. 1979. Evolution, Pathobiology, and Breeding Ecology of Large Gulls (*Larus*) in Northeast Gulf of Alaska and Effects of Petroleum Exposure on the Breeding Ecology of Gulls and Kittiwakes. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Boulder, Colorado.

_______, R. Gustin, and T. Crowe. 1991. Injury Assessment of Hydrocarbon Uptake by Sea Ducks in Prince William Sound and the Kodiak Archipelago, Alaska. State-Federal Natural Resource Damage Assessment for December 1990-November 1991. Draft Preliminary Natural Resources Damage Assessment Status Report, Bird Study Number 11.

Patton, W.W., Jr. and Matzko, J.J. 1959. Phosphate deposits in northern Alaska: U.S. Geological Survey Professional Paper 302-A, p. 1-17, 3 sheets, scale 1:1,000,000.

Paul, G.S. 1988. Physiological, Migrational, Climatological, Geophysical, Survival, and Evolutionary Implications of Cretaceous Polar Dinosaurs. *Journal of Paleontology* 62(4):640-652.

Paulson, D.R. 1995. Black-bellied Plover (*Pluvialis squatarola*). *In* The Birds of North America, No. 186 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

_______, G.D. McNabb, Jr., L.E. Hachmeister, B.E. Kirstein, J.R. Clayton, Jr., C.R. Phillips, R.T. Redding, C.L. Clary, G.S. Smith, and G.H. Farmer. 1987. Development of a Predictive Model for Weathering of Oil in the Presence of Sea Ice. Outer Continental Shelf Environmental Assessment Program Final Reports of Principal Investigators. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Outer Continental Shelf Environmental Assessment Program, and U.S. Department of Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

Pavlas, S.F., W.M. Fowler, S.J. Tonkins, and E.J. Young. 2000. ARCO Uses Vertical Loops to Contain Potential Oil Line Leaks. Pipeline and Gas Industry 83(6)53-57.

Payne, J.R, G.D. McNabb, and J.R. Clayton. 1991. Oil Weathering Behavior in Arctic Environments. In Proceedings from the Pro Mare Symposium on Polar Marine Ecology, May 12-16, 1990, Trondheim, Norway. Polar Research 10:631-662.

Pearce, J.M., D. Esler, and A.G. Degtyarev. 1998. Birds of the Indigirka River Delta, Russia: historical and biogeographic comparisons. Arctic 51(4): 361-370.

Pearson, K. 2002. Healthy Alaskans 2010: Targets and Strategies For Improved Health. Alaska Department of Health and Social Services, Division of Public Health, Anchorage, Alaska.

Pedersen, S. 1979. Regional Subsistence Land Use, North Slope Borough, Alaska. Occasional Paper No. 21 Anthropology and Historic Preservation, Cooperative Park Studies Unit, University of Alaska, Alaska Conservation and Environmental Protection, North Slope Borough, Fairbanks, Alaska

_______**. 1995.** Nuiqsut. Chapter 22 In J. A. Fall and C. J. Utermohle [eds.], An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska. Alaska Department of Fish and Game, Division of Subsistence Technical Report Number 160. Volume 5. U.S. Department of Interior, Minerals Management Service, Anchorage, Alaska

_______**. 2004.** Personal communication with Stacie McIntosh, Anthropologist/Subsistence Specialist, BLM AFO

_______**. 2006.** Monitoring of Annual Caribou Harvests in Three Communities (Nuiqsut, Barrow and Atqasuk) within the National Petroleum Reserve-Alaska: 2002-2009. Harvest Summary Report No. 4, September 2006. Report on file with Bureau of Land Management, Fairbanks District Office, Fairbanks, Alaska.

_______**, C. Scott, and R. Caulfield. 2000.** Part 1: Subsistence Economics and Oil Development - Case Studies from Nuiqsut and Kaktovik, Alaska. Part 2: Subsistence Harvest Variability in Alaska Native Communities. Open File Report No. 1-2000NS. In Alaska Department of Fish and Game, Division of Subsistence, and the University of Alaska, Department of Alaska Native and Rural Development [ed.], Fairbanks, Alaska.

_______ **and J. Taalak. 2001.** 1999-2000 Subsistence Harvest of Caribou and Other Big Game Resources in Nuiqsut, Alaska. Alaska Department of Fish and Game, Division of Subsistence, Open File Report April 2001.

Perovich, D.K. 2011. The changing arctic sea ice cover. Oceanography 24 (3): 162-173.

Perrin, W.F., B.G. Wursig, and J.G.M. Thewissen (eds). 2009. Encyclopedia of marine mammals. Academic Press/Elsevier; Amsterdam; Boston. 1316 pp.

Perry S.L., D.P. Demaster, and G.K. Silber. 1999. The great whales: history and status of six species listed as endangered under the U.S. Endangered Species Act of 1973. Mar Fish Rev 61:1–67.

Person, B.T., A.K. Prichard, G.M. Carroll, D.A. Yokel, R.S. Suydam, and J.C. George. 2007. Distribution and movements of the Teshekpuk Caribou Herd 1990-2005: prior to oil and gas development. Arctic 60:238-250.

Peterson, B.J., L. Deegan, J. Helfrich, J.E. Hobbie, M. Hullar, B. Moller, T.E. Ford, A. Hershey. 1993. Biological Responses of a Tundra River to Fertilization. Ecology 74:653-672.

Petersen, M.R. 1981. Populations, Feeding Ecology and Molt of Steller's Eiders. Condor 83: 256-262.

_______**, D.N. Weir, and M.H. Dick. 1991.** Birds of the Kilbuck and Ahklun Mountain Region, Alaska. U.S. Department of Interior, Fish and Wildlife Service, Washington, D.C. N. American Fauna 76.

________**, J.F. Piatt, and K.A. Trust. 1998.** Foods of Spectacled Eiders *Somateria fischeri* in the Bering Sea, Alaska. Wildfowl 49: 124-128.

________**, W.W. Larned, and D.C. Douglas. 1999.** At-Sea Distribution of Spectacled Eiders: A 120-year-old Mystery Resolved. Auk 116(4):1009-1020.

________**, J.B. Grand, and C.P. Dau. 2000.** Spectacled Eider (*Somateria fischeri*). In The Birds of North America, No. 547 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Peterson, C.H., S.D. Rice, J.W. Short, D. Esler, J.L. Bodkin, B.E. Ballachey, and D.B. Irons. 2003. Long-term Ecosystem Response to the Exxon Valdez Oil Spill. Science 302(5653):2082-2086.

Petukhov, S.A. and N.G. Storozhuk. 1980. Toxic Effect of Mercury on Salmon Larvae, *Oncorhynchus keta* and *Oncorhynchus kisutch*. Journal of Ichthyology 20:138-141.

Pew. 2011. An Independent Review of USGS Circular 1370: “An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas, Alaska.” 2011. Prepared for the Pew Environment Group and Ocean Conservancy. Ed: Robert B. Spies. Aug. 28, 2011

Phillips Alaska, Inc. (PAI). 2001. Colville River Unit Satellite Development Environmental Evaluation Document.

________**. 2002.** Colville River Unit Satellite Development Environmental Evaluation Document. Revised June, 2002. Anchorage, Alaska.

Phillips, L.M. and A.N. Powell. 2006. Evidence for wing molt and breeding site fidelity in King Eiders. Waterbirds 26:148–153.

________**, A.N. Powell, E.J. Taylor, and E.A. Rexstad. 2007**. Use of the Beaufort Sea by King Eiders Breeding on the North Slope of Alaska. Journal of Wildlife Management 71(6):1892–1898.

Philo, L.M., G.M. Carroll, and D.A. Yokel. 1993. Movements of caribou in the Teshekpuk Lake Herd as determined by satellite tracking: 1990-1993. Dept. of Wildlife Management, North Slope Borough, Barrow, Alaska.

________**, J.C. George, and L.L. Moulton. 1993a.** The Occurrence and Description of Anadromous Fish in the Dease Inlet/Admiralty Bay, Alaska Area, 1988-1990. Department of Wildlife Management, North Slope Borough, Barrow, Alaska.

________**, Shotts, E.B. Jr., and J.C. George. 1993.** Morbidity and mortality. *In*: Burns, J.J., Montague, J.J., and Cowles, C.J. (eds.). The Bowhead Whale. Special Publication Number 2 of the Society of Marine Mammalogy. Allen Press, Inc. Lawrence, KS.

Piatt, J.F., N.L. Naslund, and T.I. van Pelt. 1999. Discovery of a new Kittlitz’s Murrelet nest: clues to habitat selection and nest-site fidelity. Northwest Nat. 80: 8-13.

Piersma, T. and A.J. Baker. 2000. Life history characteristics and the conservation of migratory shorebirds. In: Gosling, L.M. & W.J. Sutherland (eds). Behaviour and Conservation. pp. 105–124. Cambridge University Press, Cambridge.

Pihl, L. 1994. Changes in the Diet of Demersal Fish due to Eutrophication-induced Hypoxia in the Kattegut, Sweden. Canadian Journal of Fisheries and Aquatic Sciences 51(2):321-336.

Pitelka, F.A., P.Q. Tomich, and G.W. Treichel. 1955a. Ecological relations of jeagers and owls as lemming predators near Barrow, Alaska. Ecol. Monogr. 25:85-117.

_______, **P.Q. Tomich, and G.W. Treichel. 1955b.** Breeding behavior of jeagers and owls near Barrow, Alaska. Condor 57:3-18.

_______. **1959.** Numbers, breeding schedule, and territoriality in Pectoral Sandpipers of northern Alaska. Condor 61: 233–264.

_______. **1974.** An avifaunal review for the Barrow region and north slope of arctic Alaska. Arctic and Alpine Research Vol. 6 No. 2:161-184.

Plafker, G. and H.C. Berg. 1994. An overview of the geology and tectonic evolution of Alaska, in Plafker, G. and Berg H.C., eds., The geology of America - The geology of Alaska: The Geological Society of America, Boulder, CO., vol. G-1, p. 989-1021.

Platt, J.B. 1976. Gyrfalcon nest site selection and winter activity in the western Canadian Arctic. Canadian Field-Naturalist 90:338-345.

Plattner, S. 1989. Economic Anthropology. Stanford University Press, Stanford, Connecticut.

Pleske, T. 1928. Birds of the Eurasian tundra. Mem. Boston Soc. Nat. Hist. 6: 111–485.

Pollard, R.H. and W.B. Ballard. 1993. Caribou Distribution in the Prudhoe Bay Oil Field, Summer 1992. Northern Alaska Research Studies. British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

_______, **W.B. Ballard, L.E. Noel, and M.A. Cronin. 1996a.** Parasitic insect abundance and microclimate of gravel pads and tundra within the Prudhoe Bay Oilfield, Alaska, in relation to use by caribou, *Rangifer tarandus granti.* Canadian Field-Naturalist 110:649-658.

_______, **W.B. Ballard, L.E. Noel, and M.A. Cronin. 1996b.** Summer distribution of caribou, *Rangifer tarandus granti*, in the Prudhoe Bay Oil Field, Alaska, 1990-1994. Canadian Field-Naturalist 110:659-674.

Poole, K.G. and R.G. Bromley. 1988. Interrelationships within a raptor guild in the central Canadian arctic. Can. J. Zool. 66:2275-2282.

Poppel, B., J. Kruse, G. Duhaime, and L. Abryutina. 2007. Survey of Living Conditions in the Arctic (SLiCA) Results. Anchorage: Institute of Social and Economic Research, University of Alaska Anchorage: [http://www.arcticlivingconditions.org/]

Popper, A.N. 2003. Effects of Anthropogenic Sounds on Fishes. Fisheries 28:24-31.

________, J. Fewtrell, M.E. Smith, and R.D. McCauley. 2004. Anthropogenic Sound: Effects on the Behavior and Physiology of Fishes. Marine Technology Society Journal 37:35-40.

________, M.E. Smith, P.A. Cott, B.W. Hanna, A.O. MacGillivray, M.E. Austin, and D.A. Mann. 2005. Effects of Exposure to Seismic Airgun Use on Hearing of Three Fish Species. Journal of the Acoustical Society of America 117(6):3958-3971.

Post, R.A. 1990. Effects of Petroleum Operations in Alaskan Wetlands: a Critique. Tech. Rep. No. 90-3. Juneau AK: State of Alaska, Dept. of Fish and Game, 112 p.

Powell, A.N. and S. Backensto. 2008. Productivity and Locations of Common Ravens (*Corvus corax*) Nesting on Alaska's North Slope. Unpublished Report for Bureau of Land Management, Fairbanks, AK. 37 p.

Power, G. 1997. A Review of Fish Ecology in Arctic North America. Pages 13-39. In: Fish Ecology in North America, J.B. Reynolds, ed. American Fisheries Society, Bethesda, Maryland.

Prevett, J. P. and J.F. Barr. 1976. Lek behavior of the Buff-breasted Sandpiper. Wilson Bull. 88: 500–503.

Prichard, A.K., S.M. Murphy, and M.D. Smith. 2001. Analysis and mapping of satellite telemetry data for the Teshekpuk Caribou Herd 1990-1999 with a note on five Western Arctic Caribou. Prepared for North Slope Borough Dept. of Wildlife Management, Alaska Dept. of Fish and Game, and U.S. Department of Interior, Bureau of Land Management.

________ and S.M. Murphy. 2004. Analysis and mapping of satellite telemetry data for the Teshekpuk Caribou Herd, 1990-2002; Final report. Unpubl. rept. ABR, Inc. Fairbanks, AK. viii+110 pp.

Proshutinsky, A., S. Solomon, and I. Ashik. 2010. Arctic Ocean storm surges: origin, climatology, impacts, simulations and predictions.

Prowse, T.D. and S. Beltaos. 2002. Climatic control of river-ice hydrology: a review. Hydrological Processes, 16:805–822.

________ and J.M. Culp. 2003. Ice break-up: a neglected factor in river ecology. Canadian Journal of Civil Engineering, 30:145–155.

Pullman, E.R. and B.E. Lawhead. 2002. Snow Depth Under Elevated Pipelines in Western North Slope Oilfields. Final Report. Prepared by ABR, Inc., Environmental Research & Services, Fairbanks, Alaska, for Phillips Alaska, Inc., Anchorage.

________, M.T. Jorgenson, T.C. Cater, W.A. Davis and J.E. Roth. 2005. Assessment of ecological effects of the 2002-2003 ice road demonstration project, 2004. Final report prepared for ConocoPhillips Alaska, Inc., Anchorage, AK, by ABR, Inc., Fairbanks, AK. v+34 pp.

Purves, F. 1978. The Interaction of Crude Oil and Natural Gas with Laboratory-Grown Saline Ice. EPS-4-EC-78-9. Environment Canada, Ottawa, Ontario.

Quakenbush, L.T. 1988. Spotted seal, *Phoca largha*. Pages 107-124 in JW Lentfer, ed. Selected marine mammals of Alaska: Species accounts with research and management recommendations Marine mammal commission, Wash DC.

_______ **and J. Cochrane. 1993.** Report on the conservation status of Steller's eider (*Polysticta stelleri*), a Candidate Threatened and Endangered Species. U.S. Fish and Wildlife Service, Ecological Services, Fairbanks, AK. 26 pp.

_______ **and E. Snyder-Conn. 1993.** Pathology and Contaminant Case Report on Three Steller's Eiders from Alaska. Technical Report NAES-TR-01. U.S. Department of Interior, U.S. Fish and Wildlife Service, Fairbanks, Alaska.

_______**, R.S. Suydam, K.M. Fluetsch, and C.L. Donaldson. 1995.** Breeding Biology of Steller's Eiders Nesting Near Barrow, Alaska, 1991-1994. U.S. Fish and Wildlife Service Technical Report NAES-TR-95-03. 53 pp.

_______ **and R. Suydam. 1999.** Periodic Nonbreeding of Steller's Eiders Near Barrow Alaska, with Speculations on Possible Causes. In Behaviour and Ecology of Sea Ducks. R.I. Goudie, M.R. Petersen and G.J. Robertson (eds.). Canadian Wildlife Service Occasional Paper No. 100. Environment Canada, Canadian Wildlife Service, Ottawa, Ontario.

_______**, R.H. Day, B.A. Anderson, F.A. Pitelka, and B.J. McCafferty. 2002.** Historical and Present Breeding Season Distribution of Steller's Eiders in Alaska. Western Birds 33:99-120.

_______**, R.S. Suydam, T. Obritschkewitsch, and M. Deering. 2004.** Breeding Biology of Steller's Eiders (*Polysticta stelleri*) near Barrow Alaska, 1991-1999. Arctic 57(2): 166-182.

_______**. 2007.** Preliminary satellite telemetry results for Bering-Chukchi-Beaufort bowhead whales. Paper SC/59/BRG12 presented to the Scientific Committee of the International Whaling Commission.

_______ **and H.P. Huntington. 2010.** Traditional Knowledge Regarding Bowhead Whales in the Chukchi Sea near Wainwright, Alaska. U.S. Department of the Interior, Minerals Management Service, Outer Continental Shelf Study MMS 2009-063.

_______**, R.J. Small, and J.J. Citta. 2010.** Satellite Tracking of Western Arctic Bowhead Whales. Report to U.S. Department of the Interior, Minerals Management Service (MMS), Alaska Outer Continental Shelf Region, Anchorage Alaska, under MMS Contract No. M05PC00020, MMS Alaska Environmental Studies Program.

_______**, J.J. Citta, J.C. George, R.J. Small, and M.P. Heide-Jørgensen. 2010b.** Fall and winter movements of bowhead Whales (*Balaena mysticetus*) in the Chukchi Sea and within a potential petroleum development area. ARCTIC Vol. 63 (3): 289-307.

Quinal, C.L., L.C. Thebeau, C.C. Bond, and P. Hammack. 2005. Containment and Cleanup of a Major Oil Well Blowout in Texas. In The 19th Biennial International Oil Spill Conference May 15 – 19, 2005. Miami Beach Florida. API, EPA, USCG. Washington, D.C.

Quinlan, S.E. and W.A. Lehnhausen. 1982. Arctic fox, *Alopex lagopus*, predation on nesting common eiders, *Somateria mollissma*, at icy Cape, Alaska. Canadian Field Naturalist 96(4):462-466.

Quinn, W.H., V.T. Neal, and S.E. Antunez de Mayolo. 1987: El Niño occurrences over the past four and a half centuries. J. Geophys. Res., 92, 14449-14461.

Racine, C.H., L.A. Johnson, and L.A. Viereck. 1987. Patterns of vegetation recovery after tundra fires in northwestern Alaska, U.S.A. Arctic Alpine Research 19:461-469.

_______ and R. Jandt. 2008. The 2007 'Anaktuvuk River' fire on the Arctic Slope of Alaska: a new phenomenon? pp. 247-248 in D.L. Kane and K.M. Hinkel (eds.) ninth International Conference on Permafrost – Extended Abstracts. Institute of Northern Engineering, University of Alaska, Fairbanks.

Railsback, S.F. and K.A. Rose. 1999. Bioenergetics Modeling of Stream Trout Growth: Temperature and Food Consumption Effects. Transactions of the American Fisheries Society 128:241-256.

Rasic, J.T. 2000. *Prehistoric Lithic Technology at the Tuluaq Hill Site, Northwest Alaska.* Master's Thesis, Washington State University, Pullman, Washington.

________. 2008. *Paleoalaskan Adaptive Strategies Viewed From Northwestern Alaska.* PhD Dissertation, Washington State University, Pullman, Washington.

Rausch, R. 1951/1988. Notes on the Nunamiut Eskimos and Mammals of the Anaktuvuk Pass Region, Brooks Range, Alaska. Reprinted in 1988 with Permission of the Author by the North Slope Borough Planning Department, Barrow, Alaska, from Arctic 4(3), December 1951.

Raveling, D.G. 1989. Nesting-predation rates in relation to colony size of black-brant. J. Wildl. Manage. 53(1):87-90.

Ray, D.J. 1984. Bering Strait Eskimos. In D. Damas [ed.], Handbook of North American Indians Volume 5: Arctic Smithsonian Institution, Washington, D.C.

Ray, G.C., J. McCormick-Ray, P. Berg, and H. E. Epstein. 2006. Pacific walrus: benthic bioturbator of Beringia. Journal of Experimental Marine Biology and Ecology 330:403-419.

Raynolds, M. 2007. Personal communication. Circumpolar Arctic Vegetation Map team, Jan. 12, 2007.

Read, A.J. 1999. Harbour porpoise *Phocoena phocoena* (Linnaeus, 1758). p. 323-355 *In*: S.H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals. Vol. 6: The Second Book of Dolphins and the Porpoises. Academic Press, San Diego, CA. 486 p.

Reanier, R.E. 1995. The Antiquity of Paleoindian Materials in Northern Alaska. *Arctic Anthropology*. 32:31-50.

________. **1997.** Regional Culture History and Prehistoric sites 10,000 B.C. to 1500 A.D. In: NPR-Symposium Proceedings: Science, Traditional Knowledge, and the Resources of the Northeast Planning Area of the National Petroleum Reserve Alaska. BLM, Anchorage, Alaska.

________. **2000.** Year 2000 Lake Studies in the Phillips Exploration Area, National Petroleum Reserve - Alaska. Prepared for Phillips Alaska, Inc, Anchorage, AK.

________. **2003.** Archaeological and Cultural Resources Reconnaissance in the ConocoPhillips Alaska Exploration Area, National Petroleum Reserve, Alaska, for the Year 2002. Unpublished report by Reanier and Associates, Inc. for ConocoPhillips Alaska Inc.

________. **2005.** Cultural Resources Reconnaissance For The Noatak, Nugget, and Hornet Prospects, National Petroleum Reserve, Alaska for the Year 2005. Unpublished report by Reanier and Associates, Inc. for ConocoPhillips Alaska Inc.

Reardon, J. 1981. Alaska Mammals. Vol. 8, No. 2. Anchorage, Alaska: Alaska Geographic Society, 184 pp.

Red Data Book of the Russian Federation. (Animals). 2001. Ministry of natural Resources of the Russian Federation and Russian Academy of Sciences. Moscow. AST-Astrel Publishers. In Russian: Красная книга Российской Федерации. (Животные). 2001. Министерство природных ресурсов Российской Федерации и Российская Академия Наук. Москва. АСТ-Астрель.

Reed, A., D.H. Ward, D.V. Derksen, and J.S. Sedinger. 1998. Brant (*Branta bernicla*). *In* The Birds of North America, No. 337 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Reed, E.B. 1956. Notes on Some Birds and Mammals of the Colville River, Alaska. The Canadian Field-Naturalist 70: 130-136.

Reed, M., N. Ekrol, P. Daling, O. Johansen, M.K. Ditlevsen, I. Swahn., J.L. Resby, and K. Skognes. 2004. SINTEF Oil Weathering Model User's Manual. Version 3.0. Trondheim, Norway: SINTEF Applied Chemistry, 47 p.

Reeves, R., C. Rosa, J.C. George, G. Sheffield, and M. Moore. 2012. Implications of Arctic industrial growth and strategies to mitigate future vessel and fishing gear impacts on bowhead whales. Marine Policy36 (2012): 454–462.

Reeves, R.R., B.S. Stewart, P.J. Clapham, and J.A. Powell. 2002. Guide to Marine Mammals of the World. Chanticleer Press, New York, NY.

Regehr, E.V., S.C. Amstrup, and I. Stirling. 2006. Polar bear population status in the southern Beaufort Sea. U.S. Geological Survey Open File Report 2006-1337.

_______, **C.M. Hunter, H. Caswell, S.C. Amstrup, and I. Stirling. 2009.** Survival and breeding of polar bears in the southern Beaufort Sea in relation to sea ice. Journal of Animal Ecology. Doi:10.1111/j.1365-2656.2009.01603.x

________, **C.M. Hunter, H. Caswell, S.C. Amstrup, and I. Stirling. 2010.** Survival and breeding of polar bears in the southern Beaufort Sea in relation to sea ice. Journal of Animal Ecology 7.9:117-127

Reimers, E. 1980. The major determinant for growth and fattening in Rangifer. In Proceedings of the Second International Reindeer/Caribou Symposium, E. Reimers, E. Gaare, and S. Skjensberg, eds. Roros, Norway, 1980, pp. 466-474.

Reiser, C., B. Haley, D. Savarese, and D. Ireland. 2009. Chukchi Sea Vessel–based Monitoring Program. Chapter 3 *In*: Ireland, D.S., D.W. Funk, R. Rodrigues, and W.R. Koski (eds.). Joint Monitoring Program in the Chukchi and Beaufort seas, July-November 2007. LGL Alaska Report P971-1, Report from LGL Alaska Research Associates, Inc., LGL Ltd., JASCO Research Ltd., Greeneridge Sciences, Inc., for Shell Offshore, Inc., ConocoPhillips Alaska, Inc., National Marine Fisheries Service, U.S. Fish and Wildlife Service. 445 p. plus appendices.

Reiss, B. 2010. Barrow, Alaska: Ground Zero for Climate Change. Smithsonian, March 2010. Accessed at http://www.smithsonianmag.com/science-nature/Barrow-Alaska-Ground-Zero-for-Climate-Change.html on 11/05/2010.`

Reist, J.D., J.D. Johnson, and T.J. Carmichael. 1997. Variation and Specific Identity of Char from Northwestern Arctic Canada and Alaska. Pages 250-261. In: Fish Ecology in North America, J.B. Reynolds, ed. American Fisheries Society, Bethesda, Maryland.

________, **F.J. Wrona, T.D. Prowse, M. Power, J.B. Demson, R.J Beamish, J.R. King, T.J. Carmichael, and C.D. Sawatzky. 2006a.** General Effects of Climate Change on Arctic Fishes and Fish Populations. Arctic Climate Impact Assessment, Climate Change Impacts on Arctic Freshwater Ecosystems and Fisheries. Ambio 35(7):370-380.

________, **F.J. Wrona, T.D. Prowse, M. Power, J.B. Demson, J.R. King, and R.J Beamish. 2006b**. An Overview of Effects of Climate Change on Selected Arctic Freshwater and Anadromous Fishes. Arctic Climate Impact Assessment, Climate Change Impacts on Arctic Freshwater Ecosystems and Fisheries. Ambio 35(7):381-387.

Renken, R., M.R. North, and S.G. Simpson. 1983. Waterbird studies on the Colville River delta, Alaska, 1983 summary report. Unpublished progress report, U.S. Fish and Wildlife Service, Office of Special Studies, 1011 E. Tudor Rd., Anchorage, AK 99503.

Resource Data, Inc. (RDI), Alaska Earth Sciences, Inc. (AES), and U.S. Bureau of Mines (USBM). 1995. Mineral terranes and Known Mineral Deposit Areas: Published by U.S. Bureau of Mines, metadata 5 p., plus Arc/INFO database.

Research Needs Work Group (RNWG). 2009. Recommendation on Research Needs Necessary to Implement an Alaska Climate Change Strategy.

Reuther, J.D. and S.C. Gerlach. 2005. Testing the "Dicarb Problem": A Case Study From North Alaska. *Radiocarbon* 47(3): 359-366

Revkin, A.C. 2001. Hunting for Oil; New Precision, Less Pollution. New York Times. Section F, Page 1. January 30, 2001.

Reynolds, H.V. 1979. Population biology, movements, distribution and habitat utilization of a grizzly bear population in NPR-A. pp. 129-182 in P. C. Lent (ed). Studies of selected wildlife and fish and their use of habitats on and adjacent to NPR-A, 1977-1978. Vol. 1. NPR-A Work Group 3, Anchorage, AK.

________**. 1989.** Unit 24-26 brown/grizzly bear survey-inventory progress report. pp. 174-184 in S.O. Morgan, editor. Annual report of survey-inventory activities, 1987. Volume XIX, Part V. Alaska Department of Fish and Game Federal Aid in Wildlife Restoration Progress Report Grant W-23-1, Study 4.0. Juneau. 189 pp.

________**. 1992.** Grizzly bear population ecology in the western Brooks Range, Alaska: progress report 1990 and 1991. unpubl. report. Alaska Department of Fish and Game. Fairbanks, Alaska. 90 pp.

________ **and G.W. Garner. 1987.** Patterns of grizzly bear predation on caribou in northern Alaska. International Conference on Bear Research and Management. 7:59-67.

Reynolds, J.B. 1997. Ecology of Overwintering Fishes in Alaskan Freshwaters. Pages 281-302. In: Freshwaters of Alaska: Ecological Syntheses, A.M. Milner and M.W. Oswood, eds. Springer-Verlag, New York.

Reynolds, J.E., D.L. Wetzel, and T.M. O'Hara. 2006. Human health implications of omega-3 and omega-6 fatty acids in blubber of the bowhead whale. Arctic 20(59):155-164.

Reynolds, P.E. and D.J. LaPlant. 1985. Effects of Winter Seismic Exploration Activities on Muskoxen in the Arctic National Wildlife Refuge. In Arctic National Wildlife Refuge Coastal Plain Resource Assessment. 1984 Update Report Baseline Study of the Fish, Wildlife, and Their Habitats, G.W. Garner and P.E. Reynolds (eds.). ANWR Progress Report No, FY85-2, Volume I. U.S. Department of Interior, U.S. Fish and Wildlife Service, Anchorage, Alaska.

________ **and D.J. LaPlant. 1986.** Effects of Winter Seismic Exploration Activities on Muskoxen in the Arctic National Wildlife Refuge, January-May, 1984-1985. Appendix V In Arctic National Wildlife Refuge Coastal Plain Resource Assessment, 1985 Update Report Baseline Study of the Fish, Wildlife, and Their Habitats, G.W. Garner and P.E. Reynolds (eds.). ANWR Progress Report No. FY86-4, Volume 3. U.S. Department of Interior, U.S. Fish and Wildlife Service, Anchorage, Alaska.

________**, H.V. Reynolds, III, and E.H. Follmann. 1986.** Responses of Grizzly Bears to Seismic Surveys in Northern Alaska. Pages 169-175 In International Conference on Bear Research and Management: Bears - Their Biology and Management. International Association for Bear Research and Management, Vancouver, British Columbia.

Rice, D.G. 1972. The Windust Phase in Lower Snake River Region Prehistory. Report of Investigations 50. Laboratory of Anthropology, Washington State University, Pullman, Washington.

Rice, S.D., R.B. Spies, D.A. Wolfe, and B.A. Wright (eds). 1996. Proceedings of the Exxon Valdez Oil Spill Symposium, February 2-5, 1993, Anchorage, AK. American Fisheries Society Symposium, 18.

Rich, T.H., P. Vickers-Rich, and R. Gangloff. 2002. Polar Dinosaurs. *Science.* 295:979-980.

_______. 2008. Tunneling for dinosaurs in the high Arctic: Deposits Magazine, no. 16, p. 18–22.

Richard, P.R., A.R. Martin, and J.R. Orr. 2001. Summer and autumn movements of belugas of the Eastern Beaufort Sea stock. Arctic 54:223-236.

Richardson, W.J., C.R. Greene, C.I. Malme, and D.H. Thomson. 1991. Effects of noise on marine mammals. (OCS/MMS-90/0093): LGL Ecological Research Associates, Inc., Bryan, TX

_______ and C.I. Malme. 1993. Man-made Noise and Behavioral Responses. In The Bowhead Whale, Burns JJ, Montague JJ, and Cowles (eds.). A Special Publication of the Society for Marine Mammalogy, 2. Pp 631-700.

_______, C.R. Greene, Jr., C.I. Malme, and D.H. Thomson. 1995. Marine Mammals and Noise. San Diego, CA. Academic Press.

_______. 1995b. Chapter 8: Marine mammal hearing. In W.J. Richardson, C.R. Greene Jr., C.I. Malme, and D.H. Thomson (eds.). 1995. Marine Mammals and Noise. San Diego, CA: Academic Press. pp. 205-240.

_______ (ed). 1997. Northstar marine mammal monitoring program, 1996: marine mammal and acoustical monitoring of a seismic program in the Alaskan Beaufort Sea. LGL Report TA2121-2. Report from LGL Ltd., King City, Ontario and Greeneridge Sciences Inc., Santa Barbara, CA to BP Exploration (Alaska) Inc., Anchorage, AK, and National Marine Fisheries Service, Anchorage, AK and Silver Spring, MD.

_______ (ed.). 1998. Marine mammal and acoustical monitoring of BP (Alaska)'s open water seismic program in the Alaskan Beaufort Sea, 1997. LGL Report TA2150-3. Report from LGL Ltd., King City, Ontario and Greeneridge Sciences Inc., Santa Barbara, CA to BP Exploration (Alaska) Inc., Anchorage, AK, and National Marine Fisheries Service, Anchorage, AK and Silver Spring, MD.

_______ (ed.). 1999. Marine mammal and acoustical monitoring of Western Geophysical's open-water seismic program in the Alaskan Beaufort Sea, 1998. LGL Report TA2230-3 to Western Geophysical and National Marine Fisheries Service, Anchorage, AK and Silver Spring, MD.

_______ and D.H. Thomson. 2002. Bowhead whale feeding the eastern Alaskan Beaufort Sea: update of scientific and traditional information. OCS Study MMS 2002-012. Department of the Interior Minerals Management Service, Anchorage, AK.

_______ and M.T. Williams (eds.). 2004. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 1999-2003. Annual and Comprehensive Report. LGL Report TA 4001; Prepared for BP Exploration. Anchorage, AK: BPXA.

_______ and M.T. Williams (eds.). 2005. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2004: Summary report. LGL Rep. TA4143. Rep. from LGL Ltd. (King City, Ont.), Greeneridge Sciences Inc. (Santa Barbara, CA) and WEST Inc. (Cheyenne, WY) for BP Explor. (Alaska) Inc., Anchorage, AK. 71 p.

_______ (ed.). 2008. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 1999-2004. LGL Rep. P1004 from LGL Ltd. (King City, Ontario), Greeneridge Sciences Inc. (Santa Barbara, CA), WEST Inc. (Cheyenne, WY), and Applied Sociocultural Research (Anchorage, AK) for BP Exploration (Alaska) Inc. (Anchorage, AK).

Riedy, C. 2010. A dental intervention with an Alaskan Native population: Lessons learned. International Dental Journal 60(3S2): 241-244.

Rieger, S., D.B. Schoephorster, and C.E. Furbush. 1979. Exploratory Soil Survey of Alaska. GPO 1979- 247-478/68. U.S. Department of Agriculture, Soil Conservation Service, Anchorage, Alaska.

Riordan, B., D. Verbyla, and A. D. McGuire. 2006. Shrinking ponds in subarctic Alaska based on 1950-2002 remotely sensed images Journal of Geophysical Research 111.

Riordan, Melissa. 2011. Personal Communication. Interview with Jim Ducker, Sept. 15, 2011.

Ritchie, R.J. and J.A. Curtatolo. 1984. Notes on Golden Eagle productivity and nest site characteristics, Porcupine River, Alaska, 1979-1982. Raptor Res. 16:123-127.

_______. 1987. Response of Adult Peregrine Falcons to Experimental and Other Disturbances along the Trans-Alaska Pipeline System, Sagavanirktok River, Alaska, 1985, 1986. Unpublished Report prepared for Alyeska Pipeline Service Company by Alaska Biological Research, Fairbanks, AK. 120pp.

_______. 1991. Effects of Oil Development in Providing Nesting Opportunities for Gyrfalcons and Rough-legged Hawks in Northern Alaska. Condor 93: 180-184.

_______, A.M. Wildman, and D.A. Yokel. 2003. Aerial Surveys of Cliff-nesting Raptors in the National Petroleum Reserve-Alaska, 1999 with comparisons to 1977. Bureau of Land Management, Denver, Colorado. BLM/AK/ST-03/016+6501=023. 66 pp.

_______ and J.G. King. 2003. Steller's Eider Surveys Near Barrow and the Meade River, Alaska, 2002. Unpublished Report Prepared for North Slope Borough Department of Wildlife Management, Barrow, Alaska by ABR, Inc., Fairbanks, Alaska.

______**, R.M. Burgess, J. Shook, and T. Obritschkewitsch. 2010.** Surveys for nesting and brood-rearing brant and lesser snow geese, Barrow to Fish Creek delta, Alaska, 2009 Annual Report. Unpublished report prepared for North Slope Borough Department of Wildlife Management Barrow, AK by ABR, Inc.–Environmental Research & Services Fairbanks, AK. 64 pp.

Rivera, M. 2010. Assaults in Domestic Violence Incidents: Descriptive Statistics and Predictors of Legal Resolutions. University of Alaska Anchorage Justice Center. Presentation 3/9/10: [http://justice.uaa.alaska.edu/research/2000/0601intimatepartnerviolence/0601.05.awaic.pdf]

Rizzolo, D.J. and J.A. Schmutz. 2009. Monitoring marine birds of concern in the Eastern Chukchi nearshore area (Loons) Annual Report 2009. Unpublished report for Minerals Management Service by U.S.G.S. Alaska Science Center Anchorage, AK.

Roach, S.M. 1993. ADF&G Flooded Gravel Mine Studies Since 1986 and Arctic Grayling Experimental Transplant into a Small Tundra Drainage. Alaska Department of Fish and Game, Habitat and Restoration Division. Technical Report No. 93-6.

Robards, M. 2006. Review of contaminants studies on Pacific walrus (*Odobenus rosmarus divergens*). Eskimo Walrus Commission, Kawerak Incorporated, Nome, AK. 30 pp.

______**, J.J. Burns, C. L. Meek, and A. Watson. 2009**. Limitations of an optimum sustainable population or potential biological removal approach for conserving marine mammals: Pacific walrus case study. Journal of Environmental Management 91:57-66.

Robeck, T.R., S.L. Monfort, P.P. Calle, J.L. Dunn, E. Jensen, J.R. Boehm, S. Young, and S.T. Clark. 2005. Reproduction, growth and development in captive beluga (*Delphinapterus leucas*). Zoo Biology 24:29-49.

Roberts, R.J. 1975. The Effects of Temperature on Diseases and Their Histopathological Manifestations in Fish. Pages 477-496 In: W.E. Ribelin and G. Migaki, editors. The Pathology of Fishes. University of Wisconsin Press, Madison, Wisconsin.

Robertson, G.J. and J.P. L. Savard. 2002. Long-tailed Duck (*Clangula hyemalis*). *In* The Birds of North America, No. 651 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Robilliard, G.A., J.R. Harper, J. Isaacs, and C. Foget. 1989. Chukchi sea coastal studies: coastal geomorphology, environmental sensitivity, and persistence of spilled oil. Part I. Final Report. U.S. Dep. Commer., NOAA, OCSEAP Environ. Asses. Alaskan Continental Shelf, Biol. Stud. 62:133-310.

Roby, D.D. 1978. Behavior patterns of barren-ground caribou of the Central Arctic Herd adjacent to the Trans-Alaska Oil Pipeline. M.S. Thesis. University of Alaska, Fairbanks, Alaska.

______**. 1980.** Winter activity of caribou on two Arctic ranges. In Proceedings of the Second International Reindeer/Caribou Symposium, E. Reimers, E. Gaare, and S. Skjensberg, eds. Roros, Norway, pp. 537-543.

Rode, K.D., S.C. Amstrup, and E.V. Regehr. 2010. Reduced body size and cub recruitment in polar bears associated with sea ice decline. Ecological Applications. 20:768-782.

Rodgers, J.A. and H.T. Smith. 1995. Set-back Distances to Protect Nesting Bird Colonies from Human Disturbance in Florida. Conservation Biology 9(1):89-99.

________ **and S.T. Schwikert. 2001.** Buffer-zone Distances to Protect Foraging and Loafing Waterbirds from Disturbance by Personal Watercraft and Outboard-powered Boats. Conservation Biology 16(1):216-224.

Rodrigues, R. 1992. Bird Use of Abandoned Gravel Pads in Arctic Alaska: 1990 and 1991. Report Prepared by LGL Alaska Research Associates, Inc., Anchorage, Alaska, for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

________**, R.O. Skoog, and R.H. Pollard. 1994.** Inventory of Arctic Fox Dens in the Prudhoe Bay Oil Field, Alaska. Final Report. Prepared by LGL Alaska Research Associates, Inc., Anchorage, Alaska, for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

Rojek, N.A. 2005. Breeding biology of Steller's eiders nesting near Barrow, Alaska, 2004. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, Alaska. Technical Report. 40 pp.

________**. 2006.** Breeding biology of Steller's eiders nesting near Barrow, Alaska, 2005. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, Alaska. Technical Report. 53 pp.

________**. 2007.** Breeding biology of Steller's eiders nesting near Barrow, Alaska, 2006. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, Alaska. Technical Report. 53 pp.

________**. 2008.** Breeding biology of Steller's eiders nesting near Barrow, Alaska, 2007. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, Alaska. Technical Report. 52 pp.

________ **and P.D. Martin. 2003.** Breeding biology of Steller's eiders nesting near Barrow, Alaska, 2003. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, Alaska. Technical Report. 35 pp.

Romanovsky, V.E. and T.E. Osterkamp. 1997. Thawing of the Active Layer on the Coastal Plain of the Alaskan Arctic. Permafrost and Periglacial Processes 8:1-22.

________ **et al. 2004.** How Rapidly is Permafrost Changing and What are the Impacts of These Changes? U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

Romanovsky, V.E. 2004. How rapidly is permafrost changing and what are the impacts of these changes? Essays on the Arctic, National Oceanic & Atmospheric Administration. Online: http://www.arctic.noaa.gov/essay_romanovsky.html

Ronson, B. and I. Rootman. 2004. Literacy: One of the Most Important Determinants of Health. In: D. Raphael (ed.) Social Determinants of Health: Canadian Perspectives. Toronto, ON: Canadian Scholars' Press. pp. 155-170.

Rookus, A.J. 1997. Telephone conversation on May 19, 1997, Between A.J. Rookus, Project Manager, Lounsbury and Assoc., Inc. and J. Tremont, Geographer, U.S. Department of the Interior, Mineral Management Service, Alaska Outer Continental Shelf Region; Subject: Air ports at Prudhoe Bay, cited in USDOI BLM and MMS, 1998.

Rosenberg, D. 2006. Distribution and abundance of Steller's eiders. Unpublished Report Alaska Department of Fish and Game Federal Aid Project Annual Performance Report. http://www.adfg.alaska.gov/static/home/library/pdfs/wildlife/federal_aid/eiders.pdf

Roseneau, D.A., C.E. Tull, and R.W. Nelson. 1981. Protection Strategies for Peregrine Falcons and Other Raptors Along the Planned Northwest Alaskan Gas Pipeline Route. Unpublished Report. Prepared by LGL Alaska Research Associates, Inc., Fairbanks, Alaska, for Northwest Alaskan Pipeline Company and Flour Northwest, Inc., Fairbanks, Alaska.

Rosner, K. 2009. Dirty Hands: Russian Coal, GHG Emissions & European Gas Demand, Journal of energy Security. August 27. Available online at: http://www.ensec.org/index.php?option=com_content&view=article&id=207:dirty-hands-russia-coal-ghg-emissions-aamp-european-gas-demand&catid=98:issuecontent0809&Itemid=349

Ross, B.D. 1988. Causeways in the Alaskan Beaufort Sea. EPA 910/0-88-218. U.S. Environmental Protection Agency, Region 10, Alaska Operations Office, Anchorage,. AK.

Rothe, T.C., C.J. Markon, and L.L. Hawkins. 1982. Waterbird populations and habitats in the Colville River delta, Alaska. Unpubl. Rep., U.S. Fish and Wildl. Serv., Anchorage, AK.

Rothwell, S. 2007. Conoco Phillips. Personal communication. February 27, 2007

Rovansek, R.J., L.D. Hinzman, and D.L. Kane. 1996. Hydrology of a Tundra Wetland Complex on the Alaskan Arctic Coastal Plain, U.S.A. Arctic and Alpine Research 28:311-317.

Rowe, L., J. Dollahite, and B. Camp. 1973. Toxicity of Two Crude Oils and of Kerosene to Cattle. Journal of American Veterinary Medicine Association 16:60-66.

Royer, D.L, R.A. Berner, I.P. Montañez, N.J. Tabor, D.J. Beerling. 2004. CO_2 as a primary driver of Phanerozoic climate, GSA Today, Vol. 14, No. 3, March 2004, Geological Society of America.

Rubega, M.A., D. Schamel, and D.M. Tracy. 2000. Red-necked Phalarope (*Phalaropus lobatus*). In The Birds of North America, No. 538 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Rugh, D.J., K.E. W. Shelden, and D.E. Withrow. 1995. Spotted seal sightings in Alaska 1992-93: Final Report. Annual report to the MMPA Assessment Program, Office of Protected Resources, NMFS, NOAA, 1335 East-West Highway, Silver Spring, MD 20910.

________, K.E.W. Shelden, and D.E. Withrow. 1997. Spotted Seals, *Phoca largha*, in Alaska. Marine Fisheries Review. 59(1): 1-18.

________, J. Breiwich, M. Muto, R. Hobbs, K. Sheldon, C. D'Vincent, I.M. Laursen, S. Reif, S. Maher and S. Nilson. 2008. Report of the 2006-7 census of the eastern North Pacific stock of gray whales. AFSC Processed Rep. 2008-03, 157 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle, WA 98115.

Russell, D.E. A.M. Martell, and W.A.C. Nixon. 1993. Range ecology of the Porcupine Caribou Herd in Canada. Rangifer Special Issue 8:1-168.

Russell, R.W. 2002. Pacific Loon (*Gavia pacifica*) and Arctic Loon (*Gavia arctica*). *In:* The Birds of North America, No. 657 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Ruther, J.D., N.S. Slobodina, J. Rasic, J.P. Cook and R.J. Speakman. 2008. Gaining Momentum-Late Pleistocene and Early Holocene Archaeological Obsidian Source Studies In Interior And Northern Eastern Beringia. Program and Abstracts, 73rd Annual Meeting of the Society for American Archaeology Annual Meeting, Vancouver B.C. Canada.

Ryabitsev, V.K. 2001. Birds of the Yurals and Western Siberia: guidebook. Ekaterinburg. Yural University Publishers. 608 pp.

Sanders, R.B. 1980. Coal Resources of Alaska, in Focus on Alaska's Coal '80, School of Mineral Industry, University of Alaska, Fairbanks, MIRL Report Number 50.

Safine, D.E. 2011. Breeding biology of Steller's and Spectacled Eiders Nesting Near Barrow, Alaska, 2008 – 2010. U.S. Fish and Wildlife Service Technical Report, Endangered Species Branch, Fairbanks, AK. 66 pp.

Sage, B.L. 1974. Ecological Distribution of Birds in the Atigun and Sagavanirktok River Valleys, Arctic Alaska. Can. Field-Nat. 88: 281-291.

Sauer, J.R., J.E. Hines, and J. Fallon. 2005. The North American Breeding Bird Survey, Results and Analysis 1966 - 2004. Version 2005.2. USGS Patuxent Wildlife Research Center, Laurel, MD.

Savarese, D.M., C.M. Reiser, D.S. Ireland, and R. Rodrigues. 2010. Beaufort Sea vessel-based monitoring program. (Chapter 6) In: Funk, D.W, D.S. Ireland, R. Rodrigues, and W.R. Koski (eds.). Joint Monitoring Program in the Chukchi and Beaufort seas, open water seasons, 2006–2008. LGL Alaska Report P1050-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., and JASCO Research, Ltd., for Shell Offshore, Inc. and Other Industry Contributors, and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 506 p. plus Appendices.

Scandpower AS. 2001. Blowout Frequency Assessment of Northstar. Report No. 27.83.01/R1. British Petroleum Exploration (Alaska), Anchorage, Alaska.

Scenarios Network for Alaska Planning (SNAP) 2008. Preliminary Report to the Governor's Sub-cabinet on Climate Change. SNRAS Pub. No. MP 2008-06

________**. 2010.** Tables and maps provided to BLM as part of Cooperative Agreement L10A20513, "Projected Climate Change Relevant to BLM-Managed Lands on Alaska's North Slope.

________**. 2010.** Connecting Alaska Landscapes into the Future, University of Alaska at Fairbanks, Fairbanks, Alaska. Available online at: http://ine.uaf.edu/accap/documents/2009_12_SNAP_Connectivity_Fresco_Murphy.pdf

________**. 2011,** NRP-A Climate Change Analysis: An Assessment of Climate Change Variables in the National Petroleum Reserve in Alaska, Bureau of Land Management (BLM) document, University of Alaska Fairbanks.

Schallenberger, A. 1980. Review of Oil and Gas Exploitation Impacts on Grizzly Bears. Pages 271-277 In Bears-Their Biology and Management, Fourth International Conference on Bear Research and Management, February 7, 1977, Kalispell, Montana, C.J. Martinka and K.J. McArthur (eds.). Bear Biology Association, Tonto Basin, Arizona.

Schell, D.M. 1975. Seasonal Variation in the Nutrient Chemistry and Conservative Constituents in Coastal Alaskan Beaufort Sea Waters. Research Reporting Series, Ecological Research Environmental Studies of an Arctic Estuarine System DPA-660/3-75-026. U.S. Environmental Protection Agency, National Environmental Research Center, Corvallis, Oregon.

Schell, D.M., S.M. Saupe, and N. Haubenstock. 1987. Bowhead Whale Feeding: Allocation of Regional Habitat Importance Based on Stable Isotope Techniques. *In* Importance of the Eastern Alaskan Beaufort Sea to Feeding Bowhead Whales, 1985-86, W.J. Richardson(ed.). Prepared by LGL Ecological Research Associates, Inc., for U.S. Department of Interior, Minerals Management Service, Anchorage, Alaska.

Schell, D.M. and S.M. Saupe. 1993. Feeding and Growth as Indicated by Stable Isotopes. Chapter 12 *In* The Bowhead Whale, J.J. Burns, J.J. Montague, and C.J. Cowles (eds.). The Society for Marine Mammalogy, Lawrence, Kansas.

Schiedek, D., B. Sundelin, J.W. Readman, and R.W. Macdonald. 2007. Interactions between Climate Change and Contaminants. Marine Pollution Bulletin 54:1845-1856.

Schleibe, S.L., S.C. Amstrup, and G.W. Garner. 1995. The Status of Polar Bears in Alaska, 1993. In O. Wiig, E. W. Born and G. W. Garner [eds.], Polar Bears: Proceedings of the Eleventh Working Meeting of the IUCN/SSC Polar Bear Specialist Group, Conference held in Copenhagen, Denmark. Proceedings published by IUCN, Gland, Switzerland.

Schmidt, D.R., W.B. Griffiths, and L.R. Martin. 1989. Overwintering Biology of Anadromous Fish in the Sagavanirktok River Delta, Alaska. Biological Papers of the University of Alaska 24:55-74.

Schmidt, J.H. and K.L. Rattenbury. 2012. unpublished data from e-mail dated February 9, 2012.

________**, K.L. Rattenbury, J.P. Lawler, and M.C. MacCluskie. 2012.** Using distance sampling and hierarchical models to improve estimates of Dall's sheep abundance. J. Wildlife Management 76(2): 317-327.

________**, and K.L. Rattenbury. 2010.** Using distance sampling to estimate Dall's sheep abundance in Gates of the Arctic National Park and Preserve. abstract. Annual meeting of the Alaska Chapter of The Wildlife Society. Anchorage, AK. February 9-10, 2010.

________**, M.G. Glen, and R.L. Morin. 2007.** The Longview/Lakeview barite deposits, southern National Petroleum Reserve, Alaska (NPR-A)—Potential-field models and preliminary size estimates, U.S. Geological Survey Professional Paper 1760–C, 29 p.

Schmidt, J.M., M.G. Glen, and R.L. Morin. 2007. The Longview/Lakeview barite deposits, southern National Petroleum Reserve, Alaska (NPR-A)—Potential-field models and preliminary size estimates, U.S. Geological Survey Professional Paper 1760–C, 29 p.

Schmidt-Etkin, D. 2011. Spill Occurrences: A World Overview. In: Oil Spill Science and Technology. M. Fingas, Ed. Boston: Gulf Professional Publishing; pp. 7-48.

Schmutz, J.A., K.A. Trust, and A.C. Matz. 2009. Red-throated loons (*Gavia stellata*) breeding in Alaska, USA, are exposed to PCBs while on their Asian wintering grounds. Environmental Pollution 157: 2386–2393

Schneider, W. and R. Bennet. 1979. Point Lay Synopsis. Pages 107-119. In: Native Livelihood and Dependence: A Study of Land Use Values Through Time. U.S. Department of the Interior, National Petroleum Reserve in Alaska, 105(C) Field Study No. 1.

________**, S. Pedersen, and D. Libbey. 1980.** The Barrow-Atqasuk Report: A Study of Land Use Values Through Time in the Barrow-Atqasuk Area. Occasional Paper No. 24 University of Alaska, Anthropology and Historic Preservation Cooperative Park Studies Unit, Fairbanks, Alaska and North Slope Borough, Barrow, Alaska

Schoellhorn K.J., K.A. Perham-Hester, Y.W. Goldsmith. 2008. Alaska Maternal and Child Health Data Book 2008: Health Status Edition. Anchorage, AK. Maternal and Child Health Epidemiology Unit, Section of Women's, Children's and Family Health, Division of Public Health, Alaska Department of Health and Social Services.

Schoenberg, K.M. 1995. The Post-Paleoarctic Interval in the Central Brooks Range. *Arctic Anthropology*. 32(1);51-62.

Schrader, F.C., and W.J. Peters. 1904. A Reconnaissance in Northern Alaska, Across the Rocky Mountains, Along Koyukuk, John, Anakuvuk, and Colville Rivers, and the Arctic Coast to Cape Lisburne, in 1901. U.S. Geological Survey Professional Paper 20. Government Printing Office, Washington, DC.

Schreier, H., W. Erlebach, and L. Albright. 1980. Variations in Water Quality During Winter in Two Yukon Rivers with Emphasis on Dissolved Oxygen Concentrations. Water Research 14:1345-1351.

Schueler, T. 1994. The Importance of Imperviousness. Watershed Protection Techniques 1(3):100-111.

Schweinsburg, R.E. 1974. Snow Geese Disturbance by Aircraft on the North Slope, September 1972. Arctic Gas Biological Report Series No. 14.

Scott, W.B. and E.J. Crossman. 1973. Freshwater Fishes of Canada. Fisheries Research Board of Canada Bulletin. 198 p.

Scrimgeour, G.J., T.D. Prowse, J.M. Culp, and P.A. Chambers. 1994. Ecological effects of river ice break-up: a review and perspective. Freshwater Biology, 32:261–275.

Seagars, D.J. and J. Garlich-Miller. 2001. Organochlorine compounds and aliphatic hydrocarbons in Pacific walrus blubber. Marine Pollution Bulletin 43:122-131.

Seaman, G.A., K. J. Frost, and L.F. Lowry. 1982. Foods of belukha whales (*Delphinapterus leucas*) in western Alaska. Cetology 44:1-19.

Searles, E. 2002. Food and the making of modern Inuit identities. Food & Foodways 10: 55-78.

Sedinger, J.S. and A.A. Stickney. 2000. Black Brant. In The Natural History of an Arctic Oil Field: Development and the Biota, J.C. Truett and S.R. Johnson (eds.). Academic Press, New York, New York.

Seigle, J.C., J.M. Gottschalk, and J.R. Rose. 2011. Fall 2010 Subsistence Fishery Monitoring on the Colville River. Prepared for ConocoPhilips Alaska, Inc., Anchorage, AK. Prepared by ABR Inc. – Environmental Research and Services, Anchorage, AK.

Seinfeld, J.H. 1986. Atmospheric Chemistry and Physics of Air Pollution. Wiley Interscience, New York, New York.

Seligman H.K., B.A. Laraia, and M.B. Kushel. 2010. Food Insecurity Is Associated with Chronic Disease among Low-Income NHANES Participants. J Nutr 140(2): 304-310.

Sellers, T.J., B.R. Parker, D.W. Schindler, and W.M. Tonn. 1998. Pelagic Distribution of Lake Trout (*Salvelinus namaycush*) in Small Canadian Shield Lakes with Respect to Temperature, Dissolved Oxygen, and Light. Canadian Journal of Fisheries and Aquatic Sciences 55:170-179.

Sellman, P.V., J. Brown, R.L. Lewellen, [and others]. 1975. The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska. Michael Baker, Jr., Inc., Anchorage, Alaska.

Senner, S.E. and M.A. Howe. 1984. Conservation of nearctic shorebirds. Pp. 379- 421, in J. Burger, and B. L. Olla, eds. Shorebirds: breeding behavior and populations. Plenum Press, New York, New York.

Serreze, M.C. and Barrett, A.P. 2011. Characteristics of the Beaufort Sea High. *Journal of Climate.* 24, 159-182. DOI: 10.1175/2010JCL13636.1.

Sexson, M. 2010. Migration and Habitat Use by Threatened Spectacled Eiders in the Eastern Chukchi Near and Offshore Environment: 2010 Annual Report. Unpublished report by USGS Alaska Science Center, 4210 University Drive, Anchorage, Alaska 99508.

Shapiro, B., A.J. Drummond, A. Rambaut, [and others]. 2004. Rise and Fall of the Beringian steppe bison. *Science* 306(5701):1561-1565

Shapiro, L.H., R.C. Metzner, and K. Toovak. 1979. Historical References to Ice Conditions along the Beaufort Sea Coast of Alaska. Report UAG-R-268. University of Alaska, Geophysical Institute, Fairbanks, Alaska.

Shaver, G.S., W.D. Billings, F.S. Chapin, A.E. Giblin, K.J. Nadelhoffer, W.C. Oechel, and E.B. Rastetter. 1992. Global Change and the Carbon Balance of Arctic Ecosystems. BioScience 42:433-441.

Sheehan, G.W. 1997. The Most Successful Hunters: Northern Economy A.D. 400 to Present. In: NPR-A Symposium Proceedings: Science, Traditional Knowledge, and the Resources of the Northeast Planning Area of the National Petroleum Reserve Alaska. BLM, Anchorage, Alaska.

Sheffield, G. and J.M. Grebemeier. 2009. Pacific walrus (*Odobenus rosmarus divegens*): differential prey digestion and diet. Marine Mammal Science 25:761-777.

Shell. 2010. Application for Incidental Harassment Authorization for the Non-Lethal Taking of Whales and Seals in Conjunction with Planned 2010 Exploration Drilling Program Chukchi Sea, Alaska. Submitted by: Shell Gulf of Mexico Inc. 3601 C Street, Suite 1000 Anchorage, Alaska 99503.

Shephard, R. and A. Rode. 1996. The Health Consequences of Modernization: Evidence from Circumpolar Peoples. Cambridge: Cambridge University Press. 324 p.

Sheppard, W.L. 2004. The Significance of Dog Traction for the Analysis of Prehistoric Arctic Societies. *Alaska Journal of Anthropology* 2(1-2): 70-82.

Shideler, R.T. 1986. Impacts of Human Developments and Land Use on Caribou: A Literature Review. In Impacts of Oil and Gas Development on the Central Arctic Herd. Volume 2. Technical Report 86-3. Alaska Department of Fish and Game, Habitat Division, Juneau, Alaska.

________**. 2010.** Personal communication. December 7, 2010.

______ **and J. Hechtel. 1995.** Grizzly bear use of oil fields around Prudhoe Bay, Alaska. In The Tenth International Conference on Bears, Resources and Management, July 16-20, 1995, Fairbanks, Alaska.

______ **and J. Hechtel. 2000.** Grizzly bears. pp. 105-132 In The Natural History of an Arctic Oil Field: Development and the Biota, J.C. Truett and S.R. Johnson, (eds.). Academic Press, San Diego, California.

Shields, F.D., S.S. Knight, and C.M. Cooper. 1994. Effects of Channel Incision on Base Flow Stream Habitats and Fish. Environmental Management 18(1):43-57.

Shults, B. 2006. National Park Service, Western Arctic Parklands wildlife biologist. Telephone conversation with Dave Yokel, BLM, Arctic Field Office wildlife biologist. 05-18-2006.

Silva, J.B. (ed.). 1985. Teshekpuk Lake Special Area Study Habitat Evaluation. U.S. Dept. of Interior, Bureau of Land Management, Fairbanks, Alaska.

Simmons, C.L.; K.R. Everett, D.A. Walker, A.E. Linkins, and P.J. Webber. 1983. Sensitivity of Plant Communities and Soil Flora to Seawater spills, Prudhoe Bay, Alaska. CRREL Report 83.-24. Hanover, NH: CRREL

Simpson, J. 1855. Dr. John Simpson's essay on the Eskimos of northwestern Alaska (Appendix 7), pp. 501-550 In The Journal of Rochfort Maguire, 1852-1854. Two years at Point Barrow, Alaska, aboard H.M.S. Plover in search for Sir John Franklin. Ed. by J Bockstoce. Vol. II. 1988. pp. vi + 319-584. Hakluyt Society.

Skoog, R.O. 1968. Ecology of the caribou (*Rangifer tarandus granti*) in Alaska. Ph.D. dissertation. University of California, Berkeley, California.

Slabbekoorn, H., N. Bouton, I. van Opzeeland, A. Coers, C. ten Cate, and A. Popper. 2010. A Noisy Spring: the Impact of Globally Rising Underwater Sound Levels on Fish. Trends in Ecology and Evolution 25(7):419-427.

Slack, J.F., J.A Dumoulin, J.M. Schmidt, L.E. Young, and C.S. Rombach. 2004. Paleozoic Sedimentary Rocks in the Red Dog Zn-Pb-Ag District and Vicinity, Western Brooks Range, Alaska: Provenance, Deposition, and Metallogenic Significance, Economic Geology, Vol. 99, pp. 1385-1414.

Slaughter, D.C. 1974. Trans Alaska Pipeline Field Notes.

______**. 2006.** Radiocarbon Dating of the Arctic Small Tool tradition in Alaska. *Alaska Journal of Anthropology*. 3 (2): 117-133.

Sloan, C.E. 1976. Anadromous Fish Study: Fresh Water Fish and Their Winter Habitat in NPR-4. U.S. Navy.

Sloan, C.E. 1987. Water Resources of the North Slope, Alaska. *In* Alaska North Slope Geology, I. Tailleur and P. Weimer (eds.). Society of Economic Paleontologist and Mineralogists, Pacific Section, and Alaska Geological Society.

Slobodin, S. 2001. Western Beringia At The End Of The Ice Age. *Arctic Anthropology* 38(2):31-47.

Small, R.J. and D.P. DeMaster. 1995. Alaska marine mammal stock assessments 1995. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-57, 93 pp.

Smiley, B.D. and A.R. Milne. 1979. LNG transport in Parry Channel: possible environmental hazards. Institute of Ocean Sciences. 47 p.

Smith, J., P. Johnson, P. Easton, D. Wiedman, and E. Widmark. 2008. Food Customs of Alaska Women of Childbearing Age: The Alaska WIC Healthy Moms Survey. Ecology of Food Nutrition 47(6): 485-517.

Smith, J. 2009. Proof of a Pre-Clovis People? *American Archaeology*. Winter 2009-10: 38-44

Smith, K. G. and P.G. Connors. 1993. Postbreeding habitat selection by shorebirds, water birds, and land birds at Barrow, Alaska: a multivariate analysis. Can. J. Zool. 71:1629-1638.

Smart, L.D. 2000. How Many Ice Ages Were There? http://www.unmaskingevolution.com

Smith, L., Y. Sheng, G. MacDonald, and L. Hinzman. 2005. Disappearing Arctic Lakes. Science 308(3):DOI:10.1126/science.1108142.

Smith, L.N., L.C. Byrne, C.B. Johnson, and A.A. Stickney. 1994. Wildlife Studies on the Colville River Delta, Alaska, 1993. Report Prepared by Alaska Biological Research, Inc, Fairbanks, Alaska, for ARCO Alaska, Inc.

Smith, M.D. 1996. Distribution, abundance, and quality of forage within the summer range of the Central Arctic Caribou herd. M.S. Thesis. University of Alaska, Fairbanks, Alaska.

Smith, M.E., A.S. Kane, and A.N. Popper. 2004. Acoustical Stress and Hearing Sensitivity in Fishes: Does the Linear Threshold Shift Hypothesis Hold Water? Journal of Experimental Biology 207:3591-3602.

Smith, P.S., and J.B. Mertie. 1930. Geology and Mineral Resources of Northwestern Alaska. U.S. Geological Survey. U.S. Geological Survey Bulletin 815. U.S. Government Printing Office, Washington, DC.

Smith, T.E. 1989. The status of muskoxen in Alaska. In: Proceedings of the Second International Muskoxen Symposium, P.F. Flood, ed. Saskatoon, Sask., Canada, Oct. 1-4, 1987. Ottawa, Canada: National Research Council of Canada, 350 p.

Smith, T.G. and J.R. Geraci. 1975. The Effect of Contact and Ingestion of Crude Oil on Ringed Seals of the Beaufort Sea. Dept. of the Environment, Victoria, British Columbia, Beaufort Sea Technical Rpt. #5. 66 p.

_______ and M.O. Hammill. 1981. Ecology of the ringed seal, *Phoca hispida*, in its fast ice breeding habitat. Can. J. Zool. 59: 966-981.

_______. 1985. Polar bears, *Ursus maritimus*, as predators of Belugas, *Delphinapterus leucas*. The Canadian Field Naturalist 99:71-75.

_______ and M.R.J. Hill. 1986. Polar bear, *Ursus maritimus*, depredation of Canada goose, Branta canadensis, nests. The Canadian Field Naturalist 110:339-340.

Smylie, J. 2009. The Health of Aboriginal Peoples. In Social Determinants of Health. 2nd ed. Toronto: Canadian Scholars' Press Inc. 280-301 p.

Snieszko, S.F. 1974. The Effects of Environmental Stress on Outbreaks of Infectious Diseases of Fishes. Journal of Fish Biology 6(2):197-208.

Snucins, E.J. and J.M. Gunn. 1995. Coping with a Warm Environment: Behavioral Thermoregulation by Lake Trout. Transactions of the American Fisheries Society 124:118-123.

Solecki, R.S. 1951. Notes on two archaeological discoveries in northern Alaska, 1950. *American Antiquity* 17: 55-57.

Solovieva, D. and O. Lyatieva. 2006. Spectacled Eider (*Somateria fischeri*) Research in the Chaun-Delta, West Chukotka, Russia, 2005. Unpublished report, Wrangell Island State Nature Reserve, Pevek, Chukotka, Russia. 20 pp.

Sopuck, L.G. and D.J. Vernam. 1984. Late Winter Distribution and Movements of Moose in Relation to the Trans-Alaska Pipeline in Interior Alaska. Alyeska Pipeline Service Co., Anchorage, Alaska.

_______ and D.J. Vernam. 1986. Distribution and Movements of Moose (*Alces alces*) in Relation to the Trans-Alaska Pipeline. Arctic 39(2):138-144.

Southall, B.L., A.E. Bowles, W.T. Ellison, [and others]. 2007. Marine mammal noise exposure criteria: initial scientific recommendations. Aquatic Mammals. Special Issue 33:411-521.

Spearman, G. 1979. Anaktuvuk Pass: Land Use Values Over Time. North Slope Borough, Barrow, Alaska and the University of Alaska, Anthropology and Historic Preservation Cooperative Park Studies Unit, Fairbanks, Alaska.

Speckman, S.V., D. Chernook, D. Burn, M. Udevitz, A. Kochnev, A. Vasilev, C, Jay, A. Lisovsky, A. Fischbach. , and R. Benter. 2011. Results and evaluation of a survey to estimate Pacific walrus population size, 2006. Marine Mammal Science 27(3):514-553.

Spencer, D.L. and C.J. Lensink. 1970. The Muskox of Nunivak Island. J. Wildl. Manage. 34:1-15.

Spencer, R.F. 1959. *The North Alaska Eskimo: A Study in Ecology and Society.* Bureau of American Ethnology Bulletin 171, Smithsonian Institution, Washington D.C.

________. 1976. The North Alaskan Eskimo: A Study in Ecology and Society. Dover Publications, New York.

Spetzman, L.A. 1959. Vegetation of the Arctic Slope of Alaska. Exploration of Naval Petroleum Reserve No. 4 and Adjacent Areas, Northern Alaska, 1944-1953, Part 2, Regional Studies. USGS Professional Paper 302-B: U.S. Geological Survey, pg. 34.

Spraker, T.R., L.F. Lowry, and K.J. Frost. 1994. Gross necropsy and histopathological lesions found in harbor seals. Pages 281-311, in TR Loughlin, editor. Marine Mammals and the Exxon Valdez. Academic Press, Inc., San Diego, CA.

St. Aubin, D.J. 1990. Physiologic and toxic effects on pinnipeds. In: Geraci JR and St. Aubin DJ (eds.). Sea mammals and oil: confronting the risks. Academic Press, San Diego

________, T.G. Smith, and J.R. Geraci. 1990. Seasonal epidermal molt in beluga whales, *Delphinapterus leucas*. Can. J. Zool. 68:359-367.

Stanford, D.E. 1971. Evidence of Paleo-Eskimos on the North Coast of Alaska. Paper presented at the 36th annual meeting of the Society for American Archaeology, Norman, Oklahoma

________. 1976. *The Walakpa Site, Alaska: Its Place in Birnirk and Thule Cultures.* Smithsonian Contributions to Anthropology No. 20. Smithsonian Institution, Washington, D.C.

Starfield, A.M. and F.S. Chapin, III. 1996. Model of transient changes in Arctic and boreal vegetation in response to climate and land use change. Ecological Applications 6:842-864.

Starr, S.J., M.N. Kuwada, and L.L. Trasky. 1981. Recommendations for Minimizing the Impacts of Hydrocarbon Development on Fish, Wildlife, and Aquatic Plant Resources of the Northern Bering Sea and Norton Sound. Alaska Department of Fish and Game, Anchorage, AK.

Stefan, H.G. 1992. Sediment Oxygen Demand and Its Effect on Winterkill in Lakes. *In:* Proceedings, U.S. Army Corps of Engineers Workshop on Sediment Oxygen Demand. Miscellaneous Paper W-92-1, June 1992. Final Report. p 137-142. 11 ref.

Steinacher, S. (ed.). 2010. Counting the Western Arctic Herd: Census 2009. In Caribou Trails, Issue 10, spring 2010, pp. 4-5.

Stehn, R. and R. Platte. 2000. Exposure of Birds to Assumed Oil Spills at the Liberty Project. U.S. Department of Interior, U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska.

________ and R. Platte. 2009. Steller's eider distribution, abundance, and trend on the Arctic Coastal Plain, Alaska, 1989-2008. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska. 35 pp.

Stenhouse, I.J., S. Studebaker, and D. Zwiefelhofer. 2008. Kittlitz's Murrelet (*Brachyramphus brevirostris*) in the Kodiak Archipelago, Alaska. Marine Ornithology 36: 59–66.

Steidl, R.J. and R.G. Anthony. 1996. Responses of Bald Eagles to Human Activity During the Summer in Interior Alaska. Ecological Applications 6(2):482-491.

________ and R.G. Anthony. 2000. Experimental Effects of Human Activities on Breeding Bald Eagles. Ecological Applications 10(1):258-268.

Stephen R. Braund and Associates (SRBA). 1991. North Slope Subsistence Study, Wainwright 1988 and 1989. Outer Continental Shelf Study, MMS 91-0073. Technical Report No. 136. U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Study Region, Anchorage, Alaska

________ **and Institute of Social and Economic Research (ISER). 1993.** North Slope Subsistence Study - Barrow, 1987, 1988, and 1989. U.S. Department of the Interior, Minerals Management Service Technical Report Number 149. Prepared for U.S. Department of the Interior, Minerals Management Service, and the North Slope Borough.

________**. 1993.** North Slope Subsistence Study, Wainwright, 1988 and 1989. Prepared for U.S. Department of the Interior, Minerals Management Service, Anchorage, Alaska. OCS Study MMS 91-0073.

________**. 2003a.** Unpublished Field Notes from Interviews Conducted in Nuiqsut, Barrow, Atqasuk, and Anaktuvuk Pass. July and August 2003

________**. 2003b.** Alpine Satellites Development Plan Preliminary Draft Environmental Impact Statement: Subsistence, Cultural Resources, and Traditional Knowledge Sections Prepared by SRBA.

________ **and J. Kruse (eds.). 2009.** Synthesis: Three Decades of Research on Socioeconomic Effects Related to Offshore Petroleum Development in Coastal Alaska. U.S. Department of the Interior Minerals Management Service Alaska Outer Continental Shelf Region, Environmental Studies, MMS OCS Study Number 2009-006 Anchorage, Alaska

________**. 2009.** Impacts and Benefits of Oil and Gas Development to Barrow, Nuiqsut, Wainwright, and Atqasuk Harvesters. Prepared for the North Slope Borough Department of Wildlife.

________**. 2010.** Subsistence mapping of Nuiqsut, Kaktovik, and Barrow. MMS OCS study number 2009-003.

Stephensen, C., D.W. Cramer, and D.M. Burn. 1994. Review of the marine mammal marking, tagging, and reporting program, 1988-1992. U.S. Fish and Wildlife Service. Marine Mammals Management Technical Report MMM 94-1.

Stephenson, R.O. 1979. Abundance, movements and food habits of wolves in and adjacent to NPR-A. pp. 53-87 in P. C. Lent (ed). Studies of selected wildlife and fish and their use of habitats on and adjacent to NPR-A, 1977-1978. Vol. 1. NPR-A Work Group 3, Anchorage, AK.

Stern, A.C., H.C. Wohlers, R.W. Boubel, and W.P. Lowry. 1973. Fundamentals of Air Pollution. Academic Press, New York, New York.

Stewart, D.J., D. Weininger, D.V. Rottiers, and T.A. Edsall. 1983. An Energetics Model for Lake Trout, *Salvelinus namaycush*: Application to the Lake Michigan Population. Canadian Journal of Fisheries and Aquatic Sciences 40:681-698.

Stewart, R.E.A., S.E. Campana, C.M. Jones, and B.E. Stewardl. 2006. Bomb radiocarbon dating calibrates beluga (*Delphinapterus leucas*) age estimates. Can. J. Zool. 84:1840-1852.

Stickel, L.F. and M.P. Dieter. 1979. Ecological and Physiological/Toxicological Effects of Petroleum on Aquatic Birds. A Summary of Research Activities Fiscal Year 1976 through Fiscal Year 1978. FWS/OBS-79/23. U.S. Department of Interior, Fish and Wildlife Service, Biological Services Program, Slidell, Louisiana.

Stieglitz, M., S.J. Dery, V.E. Romanovsky, and T.E. Osterkamp. 2003. The Role of Snow Cover in the Warming of Arctic Permafrost. Geophysical Research Letters 30:10.1029/2003GL017337.

Stirling I. and T.G. Smith. 2004. Implications of warm temperatures and an unusual rain event for the survival of ringed seals on the coast of Southeastern Baffin Island. Arctic 57 (1): 59-67.

Stoker, S.W. 1983. Subsistence Harvest Estimates and Faunal Resource Potential at Whaling Villages in Northwestern Alaska, pp. A-1 - A-82, Subsistence Study of Alaska Eskimo Whaling Villages. Prepared by Alaska Consultants, Inc., and Stephen R. Braund and Associates for U.S. Department of the Interior, Washington, D.C.

_______ **and Krupnik II. 1993.** Subsistence whaling. Pp. 579-629 In. Burns J.J., Montague J.J., Cowles C.J. (eds.). The Bowhead Whale. Soc. Mar. Mammal., Spec. Publ. No. 2.

Stone, S.L. and C.B. Schreck. 1994. Behavioral Responses of Juvenile Coho Salmon (*Oncorhynchus kisutch*) exposed to pulp mill effluents. Bulletin of Environmental Contamination and Toxicology 52(3):355-359.

Stone, C.J. 2003. The effects of seismic activity on marine mammals in UK waters 1998-2000. JNCC Rep. 323. Joint Nature Conserv. Commit., Aberdeen, Scotland. 43 p.

_______ **and M.L. Tasker. 2006.** The effects on seismic airguns on cetaceans in UK waters. J. Cetacean Res. Manage. 8(3):255-263.

Strang, C.A. 1980. Incidence of Avian Predators Near People Searching for Waterfowl Nests. Journal of Wildlife Management 44:220-222.

Strange, N.E. 1985. Migration, Reproduction, and Feeding of Lake Whitefish, Broad Whitefish, and Arctic Cisco in the Mackenzie River-Beaufort Sea Region: A Review of Literature. Northern Oil and Gas Action Program Project B-3: Critical Western Arctic Freshwater Habitats, Department of Fisheries and Oceans, Winnipeg, Manitoba, Canada.

Strann, K.B. and J.E. Østnes. 2007. Numbers and distribution of wintering yellow-billed and common loons in Norway. Unpublished report. Norwegian Institute for Nature Research, Tromsø, Norway and Zoologisk Institutt, Dragvoll, Norway. 9 pp

Stratton, J. 2010. National Parks Conservation Association. Letter. October 1, 2010.

Streever, B., S. Bendewald, A. McCusker, and B. Shaftel. 2001. Winter Measurements of Water Quality and Water Levels: The Effects of Water Withdrawal for Ice Road Construction on Lakes of the NPR-A. Report by BP Exploration, Oasis Environmental, Inc., and Hoefler Consulting Group, Anchorage, AK.

Stroeve, J., M. Serreze, S. Drobot, S. Gearheard, M.M. Holland, J. Maslanik, W. Meier, and T. Scambos. 2008. Arctic sea ice extent plummets in 2007. EOS Transactions, AGU 89:13-20.

Stuart Smith, J.J., and J.H.N. Wennekers. 1977. Geology and Hydrocarbon Discoveries of Canadian Arctic Islands. American Association of Petroleum Geologists Bulletin 611:1-27.

Stuff J.E., P.H. Casey, K.L. Szeto, J.M. Gossett, J.M. Robbins, P.M. Simpson, C. Connell, and M.L. Bogle. 2004. Household food insecurity is associated with adult health status. Journal of Nutrition, 134(9), 2330-2335.

Sturm, M., C.R. Racine, and K. Tape. 2001. Increasing shrub abundance in the arctic. Nature 411:546-547.

_______, J. Schimel, G. Michaelson, J.M. Welker, S.F. Oberbauer, G.E. Liston, J.Fahnestock and V.E. Romanovsky. 2005. Winter biological processes could help convert Arctic tundra to shrubland. BioScience 55: 17-26.

Summerfield, B.L. 1974. Population dynamics and seasonal movement patterns of Dall sheep in the Atigun Canyon area, Brooks Range, Alaska. M.S. Thesis. University of Alaska, Fairbanks. viii+109 pp.

Suryan R.M. and Harvey J.T. 1999. Variability in reactions of Pacific harbor seals, *Phoca vitulina richardsi*, to disturbance. Fisheries Bulletin 97:332-339.

Suydam, R.S. 2000. King Eider (*Somateria spectabilis*). *In* The Birds of North America, No. 491 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

_______ and J.C. George. 1992. Recent sightings of harbor porpoises, *Phocoena phocoena*, near Point Barrow, Alaska. Canadian Field-Naturalist 106:489-492.

_______, D.L. Dickson, J.B. Fadely, and L.T. Quakenbush. 2000. Population declines of king and common eiders of the Beaufort Sea. Condor 102:219-222.

_______, L.F. Lowry, K.J. Frost, G.M. O'Corry-Crowe, and D. Pikok Jr. 2001. Satellite tracking of eastern Chukchi Sea beluga whales in to the Arctic Ocean. Arctic. 54(3):237-243.

_______. 2004. Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Eskimos, 1974 to 2003. Paper SC/56/BRG12 presented to the Scientific Committee of the International Whaling Commission.

_______, K.J. Frost, and L. Lowry. 2005. Distribution and movements of beluga whales from the eastern Chukchi Sea stock during summer and early autumn. Final Report OCS Study MMS 2005-035. University of Alaska, Coastal Marine Institute, Fairbanks. 48 pp.

_______. 2009. Age, growth, reproduction, and movements of beluga whales (*Delphinapterus leucas*) from the eastern Chukchi Sea. Ph.D. Dissertation. University of Washington, School of Aquatic and Fishery Sciences. Seattle, WA. 169pp.

________, J.C. George, B. Person, C. Hanns, and G. Sheffield. 2010. Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Eskimos during 2010. Paper SC/63/BRG2 presented to the International Whaling Commission Scientific Committee.

Swanson, H.K., K.A. Kidd, J.A. Babaluk, R.J. Wastle, P.P. Yang, N.M. Halden, and J.D. Reist. 2010. Anadromy in Arctic Populations of Lake Trout (*Salvelinus namaycush*): Otolith Microchemistry, Stable Isoptopes, and Comparisons with Arctic Char (*Salvelinus alpinus*). Canadian Journal of Fisheries and Aquatic Sciences 67:842-853.

Swem, T., C. McIntyre, R.J. Ritchie, P.J. Bente, and D.G. Roseneau. 1994. Distribution, abundance, and notes on the breeding biology of Gyrfalcons *Falco rusticolus* in Alaska. Raptor conservation today; proceedings of the IV World Conference on Birds of Prey and Owls, Berlin, Germany 10 – 17 May 1992. 437 – 466 p.

________. 1996. Aspects of the breeding biology of Rough-legged Hawks along the Colville River, Alaska. Master's thesis, Boise State Univ., Boise, ID.

________. 1997. Personal communication concerning distribution and abundance of Arctic Peregrine Falcons and Gyrfalcons in NPR-A. During USDOI Minerals Management Service NPR-A Symposium, April 16-18, 1997, Anchorage, AK.

Szymanski, M.D., D.E. Bain, K. Kiehl, S. Pennington, S. Wong, and K.R. Henry. 1999. Killer Whale (*Orcinus orca*) Hearing: Auditory Brainstem Response and Behavioral Audiograms. J. Acoust. Soc. Am. 106: 1134-1141.

Tack, S.L. 1980. Distribution, Abundance and Natural History of the Arctic Grayling in the Tanana River Drainage. Annual Performance Report for Migrations and Distribution of Arctic Grayling (*Thymallus arcticus*) in Interior and Arctic Alaska. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980. Project F-9-12, 21(Study R-I).

Takekawa, J.Y. and N. Warnock. 2000. Long-billed Dowitcher (*Limnodromus scolopaceus*). *In* The Birds of North America, No. 493 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Talbot, S.S. 1996. Vegetation Mapping in Arctic Alaska, an Annotated Bibliography. In: Circumpolar Arctic Vegetation Mapping Workshop: Abstracts and Short Papers, C.J. Markon and D.A. Walker, eds. Reston, VA: U.S. Geological Survey.

Tarazona, J.V., and M.J. Munoz. 1995. Water Quality in Salmonid Culture. Reviews in Fisheries Science 3(2):109-139.

Taylor, A.R., R.B. Lanctot, A.N. Powell, F. Huettmann, D.A Nigro, and S.J. Kendall. 2010a. Distribution and community characteristics of staging shorebirds on the northern coast of Alaska. Arctic 63(4):451-467.

________, R.B. Lanctot, A.N. Powell, S.J. Kendall, and D.A Nigro. 2010b. Residence Time and Movements of Post-breeding Shorebirds on the Northern Coast of Alaska. The Condor 113(4):799-794.

________. **2011.** Postbreeding ecology of shorebirds on the Arctic coastal plain of Alaska. PhD thesis, University of Alaska Fairbanks. 216 pp.

Taylor, D.L., S. Schliebe, and H. Metsker. 1989. Contaminants in blubber, liver and kidney tissue of Pacific walruses. Marine Pollution Bulletin 20:465-468.

Teal, J.M. and R.W. Howarth. 1984. Oil Spill Studies: a Review of Ecological Effects. Environmental Management 8(1):27-44.

Terres, J.K. 1982. The Audubon Society Encyclopedia of North American Birds. Alfred A. Knopf, New York, New York.

The Moscow News. June 6, 2008. Russia's Carbon Emissions: A Truly Burning Issue.

Thewissen, J.G.M, J. George, C. Rosa, and T. Kishida. 2011. Olfaction and brain size in the bowhead whale (*Balaena mysticetus*). Mar. Mamm. Sci. 27: 282-294.

Thomas, C.P.; W.B. North, T.C. Doughty, D.M. Hite. 2009. Alaska North Slope Oil and Gas A Promising Future or an Area in Decline? Addendum Report. USDOE, National Energy Technology Lab, Fairbanks, AK. DOE/NETL-2009/1385. Available at: http://www.netl.doe.gov/technologies/oil-gas/publications/AEO/ANS_Potential.pdf.

Thompson, D.C. and K.H. McCourt. 1981. Seasonal diets of the porcupine caribou herd. American Midland Naturalist 105(1):70-76.

Thompson, M. 2007. Mike Thompson interview by Jim Ducker, March 1, 2007.

Thrush, P.W. (ed.). 1968. A dictionary of mining, mineral, and related terms: U.S. Bureau of Mines, 1269 p.

Tieszen, L.L. 1978. Vegetation and Production Ecology of an Alaskan Arctic Tundra. Ecological Studies 29. Springer-Verlag, New York, New York.

Todd, S, P. Stevick, J. Lien, F. Marques, and D. Ketten. 1996. Behavioral effects to underwater explosions in Humpback Whales (*Megaptera novaeangliae*). Can. J. Zool. 74: 1661-1672.

Tonkivich, P.S. 1992. An analysis of the geographic variability in Knots *Calidris canutus* based on museum skins. Wader Study Group Bull. 64(Suppl.): 17-23.

Tonn, W.M. 1990. Climate Change and Fish Communities: a Conceptual Framework. Transactions of the American Fisheries Society 119:337-352.

Tracey, B. 2010. Scoping Testimony. National Petroleum Reserve- Alaska Draft IAP/EIS. Point Lay, Alaska, September 27, 2010.

Tracey, S.D. 2002. Aerial surveys of endangered whales in the Beaufort Sea. Fall 2001. OCS study MMS 2002-061. Anchorage ,AK: USDOI, MMS, Alaska OCS Region, 117 pp.

Tracy, D.M., D. Schamel, and J. Dale. 2002. Red Phalarope (*Phalaropus fulicarius*). *In* The Birds of North America, No. 698 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Trans-Alaska Pipeline System Owners (TAPSO). 2001. Environmental Report for Trans-Alaska Pipeline System Rights-of-Way Renewal.

Travis, R. 1984. Suicide and Economic Development among the Inupiat Eskimo. White Cloud Journal 3: 14-20.

Treacy, S.D. 1988. Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1987. Outer Continental Shelf Study MMS 88-0030, NTIS PB89-168785. U.S. Department of Interior, Minerals Management Service, Anchorage, Alaska.

________. **1989.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1988. Outer Continental Shelf Study MMS 89-0033, NTIS PB90-161464. U.S. Department of Interior, Minerals Management Service, Anchorage, Alaska.

________. **1990.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1989. Outer Continental Shelf Study MMS 90-0047, NTIS PB91-235218. U.S. Department ofInterior, Minerals Management Service, Anchorage, Alaska.

________. **1991.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1990. Outer Continental Shelf Study MMS 91-0055, NTIS PB92-176106. U.S. Department ofInterior, Minerals Management Service, Anchorage, Alaska.

________. **1992.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1991. Outer Continental Shelf Study MMS 92-0017. U.S. Department of Interior, MineralsManagement Service, Anchorage, Alaska.

________. **1993.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1992. Outer Continental Shelf Study MMS 93-0023. U.S. Department of Interior, MineralsManagement Service, Anchorage, Alaska.

________. **1994.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1993. Outer Continental Shelf Study MMS 94-0032. U.S. Department of Interior, MineralsManagement Service, Anchorage, Alaska.

________. **1995.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1994. Outer Continental Shelf Study MMS 95-0033. U.S. Department of Interior, MineralsManagement Service, Anchorage, Alaska.

________. **1996.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1995. Outer Continental Shelf Study MMS 96-0006, NTIS PB97-115752. Anchorage, Alaska. Treacy, S.D. 1997. Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1996. Outer Continental Shelf Study MMS 97-0016, NTIS PB97-194690. U.S. Department of Interior, Minerals Management Service, Anchorage, Alaska.

________. **2000.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1998-1999.Outer Continental Shelf Study MMS 2000-066. U.S. Department of Interior, Minerals Management Service, Anchorage, Alaska.

________. **2002a.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 2000. Outer Continental Shelf Study MMS 2002-014. U.S. Department of Interior, Minerals Management Service, Anchorage, Alaska.

_______. **2002b.** Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 2001. Outer Continental Shelf Study MMS 2002-061. U.S. Department of Interior, Minerals Management Service, Anchorage, Alaska.

Tripp, D.B. and P.J. McCart. 1974. Life Histories of Grayling (*Thymallus arcticus*) and Longnose Suckers (*Catostomus catostomus*) in the Donnelly River system, Northwest Territories. Pages 1-91 in P.J. McCart, editor. Life histories of anadromous and freshwater fish in the western Arctic. Arctic Gas Biological Rep. Service, Vol. 20.

Trovato, F. 2001. Aboriginal Mortality in Canada, the United States and New Zealand. Journal of Biological Sciences 33: 67-86.

Troy, D.M. 1988. Bird Use of the Prudhoe Bay Oil Field During the 1986 Nesting Season. Report Prepared by LGL Alaska Research Associates, Inc., Anchorage, Alaska, for Alaska Oil and Gas Association, Anchorage, Alaska.

________ **and T.A. Carpenter. 1990.** The Fate of Birds Displaced by the Prudhoe Bay Oil Field: The Distribution of Birds Nesting Before and After P-Pad construction. Report Prepared by Troy Ecological Research Associates, Anchorage, Alaska, for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

________. **1991.** Bird use of disturbed tundra at Prudhoe Bay, Alaska: Bird and nest abundance along the abandoned peat roads. 1988-1989. Unpublished Report by Troy Ecological Research Associates for BP Exploration (Alaska) Inc.

________. **1996.** Population Dynamics of Breeding Shorebirds in Arctic Alaska. International Wader Study 8:15-27.

________. **2000.** Shorebirds. *In*: Truett, J.C., and Johnson, S.R., eds. The natural history of an Arctic oil field. San Diego: Academic Press. 277–303.

________. **2003.** Molt Migration of Spectacled Eiders in the Beaufort Sea Region. Report Prepared by Troy Ecological Research Associates, Anchorage, Alaska, for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

________. **2007.** Movements of National Petroleum Reserve-Alaska Glaucous Gulls: 2007 Progress Report. Unpublished report for Bureau of Land Management, Fairbanks, AK. 5 p.

Troy Ecological Research Associates (TERA). 1992. Trends in Bird Use of the Pt. McIntyre Reference Area 1981-1991. Report Prepared for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

________. **1993.** Population dynamics of birds in the Pt. McIntyre Reference Area, 1981-1992. Report Prepared for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

________. **2002.** Spectacled eider movements in the Beaufort Sea: Distribution and timing of use. Report for BP Alaska Inc., Anchorage, Alaska and Bureau of Land Management, Fairbanks, Alaska. 17 p.

Truett, J.C. and S.R. Johnson. 2000. The Natural History of an Arctic Oilfield. New York Academic Press.

Tulp I. and H. Schekkerman. 2008. Has prey availability for Arctic birds advanced with climate change? Hindcasting the abundance of tundra arthropods using weather and seasonal variation. Arctic 61(1):48-60.

Turnpenny, A.W.H. and J.R. Nedwell. 1994. The Effects on Marine Fish, Diving Mammals and Birds of Underwater Sound Generated by Seismic Surveys. Report Prepared By Fawley Aquatic Research Laboratories Ltd. for United Kingdom Offshore Operators Association Limited, London, England.

Twiss, R.J. and E.M Moores. 1992. Structural Geology, W.H. Freeman and Company, pg. 4.

Tyler, N.J.C. 1991. Short-Term Behavioural Responses of Svalbard Reindeer *Rangifer Tarandus Platyrhynchus* to Direct Provocation by a Snowmobile. Biological Conservation 56:179-194.

Tyler, R., A.R. Scott, and J.G. Clough. 1998. Coal bed methane potential and exploration targets for rural Alaskan communities: State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys. Prepared for State of Alaska under Agreement No. UTA 97-0042, by Bureau of Economic Geology, Noel Tyler, Director, The University of Texas at Austin, Austin, Texas, 78713-8924, August 1998, 168 p.

Tynan, C.T. and D.P. DeMaster. 1997. Observations and predictions of Arctic climatic change: potential effects on marine mammals. Arctic 50:308-322.

Udevitz, M.S., C.V. Jay, A.S. Fischbach, and J.L. Garlich-Miller. 2009. Modeling haul-out behavior of walruses in Bering Sea ice. Canadian Journal of Zoology. 87 (12):1111-1128.

Ungerlieder, C. and D. Keating. 2002. The Social Determinants of Health: Education as a Determinant of Health. Public Health Agency of Canada, The Social Determinants of Health Across the Life-Span Conference, Toronto, Ontario.

United Nations Framework Convention on Climate Change (UNFCCC). 2012. website, Accessed May 2012, Available at: http://unfccc.int/2860.php

U.S. Air Force (USAF). 2006. Focused Installation Restoration Program and Clean Sweep Demolition Point Lay Long Range Radar Station, Alaska. 611 CES/CEVR Elmendorf AFB, Alaska.

________**. 2010.** Final Work Plan LF001 and SS009 Cape Lisburne Long Range Radar Site. 611 CES/CEVR Elmendorf AFB, Alaska.

U.S. Coast Guard (USCG). 2010. Coast Guard Arctic Operations: An Overview [Report]. - 2010.

________. **2012.** Standards for living organisms in ships' ballast water discharged in U.S. waters (33CFR Part 151 and 46 CFR Part 162) March 23, 2012. Ballast Water Frequently Asked Questions, revised August 17, 2012. Online at: http://www.uscg.mil/hq/cg5/cg522/cg5224/docs/BWDS.Aug.17.2012Revision.pdf

U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). 1999. *Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys.* USDA Natural Resource Conservation Service Agriculture Handbook # 436, U.S. Government Printing Office, Washington DC.

________. **NRCS 2010.** Keys to Soil Taxonomy, 11th edition

________. **NRCS. 2011.** The PLANTS Database (http://plants.usda.gov, 11 January 2011). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

U.S. Department of Commerce, Bureau of Economic Analysis (USDOC BEA). 2010. Regional Economic Accounts: http://www.bea.gov/.

U.S. Department of Commerce (USDOC), Bureau of the Census. 1991. 1990 Census of Population and Housing, Alaska Final Population and Housing, Summary Tape File 1A. Volume 1. Issued September 1991. CD90-1A-9-1. U.S. Department of Commerce (USDOC), Bureau of the Census, Data User Division, Washington, D.C.

________. **2000.** Census 2000 http://www.census.gov/main/www/access.html; http://www.census.gov/prod/cen2000/index.html

________. **2000.** Profile of General Demographic Characteristics: 2000. Geographic Area: North Slope Borough, Alaska and Geographic Area: Northwest Arctic Borough, Alaska. [http://censtats.census.gov/cgi-bin/pct/pctProfile.pl]

________. **2010.** Census 2010 http://www.census.gov/main/www/access.html; http://www.census.gov/prod/cen2010/index.html

U.S. Department of Commerce, National Oceanic and Atmospheric Administration (USDOC NOAA). 1997. United States Government Flight Information Supplement for Alaska. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Washington, D.C.

________. **2008.** Final Environmental Impact Statement for Issuing Quotas to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2008 through 2012. [cited 2011 June 23]. Available from http://www.fakr.noaa.gov/protectedresources/whales/bowhead/eis0108/default.htm

________. **2009.** List of fisheries. Federal Register 74:58859-58901.

________. **2009a.** Endangered and Threatened Wildlife and Plants; Proposed Threatened and Not Warranted Status for Distinct Population Segments of the Spotted Seal. . Federal Register / Vol. 74, No. 201 / Tuesday, October 20, 2009 / Proposed Rules.

________. **2010a.** Endangered and Threatened Species; Proposed Threatened and Not Warranted Status for Subspecies and Distinct Population Segments of the Bearded Seal. 2010a. Federal Register / Vol. 75, No. 237 / Friday, December 10, 2010 / Proposed Rules.

________. **2010b.** Endangered and Threatened Species; Proposed Threatened Status for Subspecies of the Ringed Seal. 2010b. Federal Register / Vol. 75, No. 237 / Friday, December 10, 2010 Proposed Rules.

________. **2011.** 2011 Arctic Seal Disease Outbreak Fact Sheet. November 22, 2011.

________. **2011b.** Deaths of ringed seals in Alaska declared an unusual mortality event; walrus pending. NOAA Fisheries News Release. http://alaskafisheries.noaa.gov/newsreleases/2011/umedeclaration2011.htm [7/16/2012]

________. **2011.** (NMFS unpublished data). National Marine Fisheries Service. Beaufort and Chukchi Seas raw data regarding seal reactions to COMIDA and BWASP marine mammal surveys.

________. **2012a.** Northern pinnipeds (ice seals and walruses) unusual mortality event (UME) March 2012 update. http://alaskafisheries.noaa.gov/protectedresources/seals/ice/diseased/default.htm

________. **2012b.** Northern pinnipeds (ice seals and walruses) unusual mortality event (UME) Q&A June 25, 2012. http://alaskafisheries.noaa.gov/protectedresources/seals/ice/diseased/default.htm

________. **2012c.** 2011 Northern pinnipeds unusual mortality event (UME) preliminary assessment of radionuclide exposure. February 17, 2012. http://alaskafisheries.noaa.gov/protectedresources/seals/ice/diseased/default.htm

U.S. Department of Defense (USDOD), U.S. Army Corps of Engineers (USACE). 1980. Final Environmental Impact Statement, Prudhoe Bay Oil Field, Waterflood Project. U.S. Army Corps of Engineers, and Environmental Research and Technology, Alaska District, Anchorage, AK.

________. **1984.** Final Environmental Impact Statement, Prudhoe Bay Oil Field, Endicott Development Project. U.S. Army Corps of Engineers, Alaska District, Anchorage, AK.

________. **1987.** "Corps of Engineers wetlands delineation manual," Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A176 912

________. **1998.** Draft Environmental Impact Statement. Beaufort Sea Oil and Gas Development/Northstar Project. Appendix B. U.S. Army Corps of Engineers, Alaska Division, Anchorage, Alaska

________. **1999.** Final Environmental Impact Statement. Beaufort Sea Oil and Gas Development/Northstar Project. Seven Volumes. U.S. Army Corps of Engineers, Anchorage, Alaska

________. **2012.** Draft Environmental Impact Statement. Alaska Stand Alone Gas Pipeline. Volume 1. U.S. Army Corps of Engineers, Alaska Division, Anchorage, Alaska.

U.S. Department of Energy (DOE). 1999. Environmental Benefits of Advanced Oil and Gas Exploration and Production Technology. DOE-FE-0385. U.S. Department of Energy, Office of Fossil Energy, Washington, DC.

________. **2001.** Alaska wind resource map. National Renewable Energy Laboratory

________. **2006.** Alaska Mainland Regions 50 m Wind Power map, U.S. Department of Energy, National Renewable Energy Laboratory, 18 January 2006, available online at: http://www.windpoweringamerica.gov/.

________. **2008a.** Photovoltaic Solar Resource of the United States Map. U.S. Department of Energy, National Renewable Energy Laboratory, 20 October 2008,available online at: http://www.nrel.gov/gis/solar.html.

________. **2008b.** Concentrating Solar Resource of the United States Map. U.S. Department of Energy, National Renewable Energy Laboratory, 20 October 2008,available online at: http://www.nrel.gov/gis/solar.html.

________. **2011.** Annual Energy Outlook 2011 with Projections to 2035.

________. **2011.** Energy Information Administration (USDOE/EIA). Crude Oil Production, Annual-Thousand Barrels Data for 2005 to 2010. http://tonto.eia.doe.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_a.htm

U.S. Department of the Interior, Bureau of Land Management (USDOI BLM). 1978. National Petroleum Reserve – Alaska 105(c) Land Use Study, NPR – A Task Force, Anchorage, Alaska

________. **1978a.** National Petroleum Reserve – Alaska 105(c) Land Use Study: National Petroleum Reserve in Alaska, Physical Profile Study Report 1. U.S. Department of Interior, Bureau of Land Management, NPR – A Task Force, Anchorage, Alaska.

________. **1978b.** National Petroleum Reserve – Alaska 105(c) Land Use Study: Visual Section. U.S. Department of Interior, Bureau of Land Management, NPR – A Task Force, Anchorage, Alaska.

________. **1978c.** National Petroleum Reserve – Alaska 105(c) Investigations. U.S. Department of Interior, Bureau of Land Management, NPR – A Task Force, Anchorage, Alaska.

________. **1978d.** National Petroleum Reserve – Alaska 105(c) Land Use Study: Recreation Resources Wildlife Viewing Area. Volume 2, Section 3. U.S. Department of Interior, Bureau of Land Management, NPR – A Task Force, Anchorage, Alaska.

________. **1978e.** National Petroleum Reserve – Alaska 105(c) Land Use Study: Values and Resource Analysis Study Report 2. Volume 3, Section 6. U.S. Department of Interior, Bureau of Land Management, NPR – A Task Force, Anchorage, Alaska.

________. **1979.** "Planning Area Analysis", National Petroleum Reserve in Alaska Task Force 105(c), Study Reports.

________. **1981.** Engineering Considerations for Gravel Alternatives in the NPR-A. Appendix 8. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska.

________. **1982a.** Scoping Document for Future oil and Gas Leasing in NPR-A. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska.

________. **1982b.** The Scoping Process as a Decisions Framework: The NPR-A Experience. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska.

________. **1982c.** Barrow Subsistence Hearing, Anchorage, Alaska.

________. **1983.** Final Environmental Impact Statement for Oil and Gas Leasing and Development in the National Petroleum Reserve In Alaska.

________. **1983b.** Oil and Gas Leasing in the National Petroleum Reserve in Alaska: A Record of Decision. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska.

________. **1983c.** Oil and Gas Leasing in the National Petroleum Reserve in Alaska: 810 Analysis. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska.

________. **1984.** Manual Handbook 8400 "Visual Resource Management."

________. **1986.** Manual Handbook 8410-1 "Visual Resource Inventory."

________. **1986.** Manual Handbook 8431-1 "Visual Resource Contrast Rating."

________. **1990.** Western Arctic Resource Management Plan, Subsistence Management Analysis. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska.

________. **1990b.** National Petroleum Reserve-Alaska. Lease History Summary. 6 p.

________. **1991.** The NPR-A: A Reader, Anchorage, Alaska.

________. **1993.** Wild and Scenic Rivers – Policy and Program Direction for Identification, Evaluation and Management. BLM Manual REL 8-61.

________. **1997.** Public Scoping Meeting on the National Petroleum Reserve-Alaska, April 10, 1997, Nuiqsut, Alaska. U.S. Department of the Interior, Bureau of Land Management Anchorage, Alaska.

________. **1998.** Final Integrated Activity Plan/Environmental Impact Statement, Northeast National Petroleum Reserve–Alaska.

________. **1998b.** Record of Decision for the Northeast National Petroleum Reserve – Alaska Integrated Activity Plan/Environmental Impact Statement. U.S. Department of Interior, Bureau of Land Management, Anchorage, Alaska.

________. **2001.** Active Lease Summary Table. List of Alaska Region Lease Sales. Minerals Management Services, Alaska Region, U.S. Department of the Interior, [http://alaska.boemre.gov/lease/hlease/LeasingTables/act_lease_sum.pdf].

________. **2002.** National Petroleum Reserve – Alaska earth cover classification. BLM-Alaska Technical Report 40. BLM/AK/ST-02/013+6500+931. Anchorage, AK. x+81 pp.

________. **2002.** (TAPS Renewal). Final Environmental Impact Statement: Renewal of the Federal Grant for the Trans-Alaska Pipeline System Right-of-Way. BLM/AK/PT 03/005+2880+990. 7 Vols. Anchorage, AK: USDOI, BLM.

________. **2003.** Integrated Activity Plan/Environmental Impact Statement, Northwest National Petroleum Reserve–Alaska

________. **2003.** Environmental Assessment for Total E&P USA 2003-2004 Winter Oil and Gas Exploration. EA-AK-023-03-32. Bureau of Land Management Fairbanks, Alaska.

________. **2004.** Northwest National Petroleum Reserve-Alaska Integrated Activity Plan/Environmental Impact Statement Record of Decision, 2004.

________. **2004b.** Alpine Satellite Development Plan Final Environmental Impact Statement. Volumes 1,2, and 3. U.S. Department of Interior, Bureau of Land Management, Anchorage, Alaska.

________. **2004.** Alaska Minerals Information System (AMIS) database: Available from BLM Alaska, Alaska State Office, Division of Energy and Solid minerals, Branch of Solid Minerals, Download dated November, 4, 2004.

________. **2004.** Alaska Legacy Wells Summary Report: National Petroleum Reserve-Alaska, Rob Brumbaugh and Stan Porhola, BLM/AK/ST-05/004+2630+941 November 2004

________. **2005.** Northeast National Petroleum Reserve-Alaska Final Amended Integrated Activity Plan/Environmental Impact Statement. BLM/AK/PL-05/006+1610+930. Anchorage, AK: USDOI BLM.

________. **2005.** BLM Land Use Planning Handbook. H-1601-1.

________. **2005.** South National Petroleum Reserve-Alaska Scoping Report. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska

________. **2005.** Impacts of Ice Roads and Ice Pads on Tundra Ecosystems, National Petroleum Reserve-Alaska. Scott Guyer and Bruce Keating. Open File Report 98. Bureau of Land Management, Anchorage, Alaska. April 2005. 56 pp.

________. **2006.** Draft Integrated Activity Plan/ Environmental Impact Statement, South National Petroleum Reserve–Alaska – internal document

________. **2007.** NPR-A Supplemental FEIS.

________. **2008.** Northeast National Petroleum Reserve-Alaska Final Supplemental Integrated Activity Plan/ Environmental Impact Statement. BLM/AK/PL-08/016+1610+930. Anchorage, AK: USDOI BLM.

________. **2008.** Bureau of Land Management Special Status Species Manual 6840. U.S. Department of Interior, Bureau of Land Management. Washington, D.C.

________. **2008.** Final Programmatic Environmental Impact Statement of Geothermal Leasing in the Western United States, Volume 1 Programmatic Analysis. (October). Washington, D.C.

________. **2010.** Public Scoping Meeting on the National Petroleum Reserve in Alaska Integrated Activity Plan/Environmental Impact Statement, September 16, 2010, Nuiqsut, Alaska. U.S. Department of the Interior, Bureau of Land Management, Fairbanks, Alaska

________. **2011.** Manual 6300-1 “Wilderness Inventory”.

________. **2012.** Environmental Baseline Studies/NPR-A Permit for Shell Gulf of Mexico Inc. Environmental Assessment prepared by Bureau of Land Management, Arctic Field Office. Fairbanks, Alaska. EA# DOI-BLM-LLAK010-2012-0009-EA

U.S. Department of the Interior Bureau of Land Management Subsistence Advisory Panel (U.S. DOI BLM SAP). 2002. Final NPR-A Subsistence Advisory Panel Meeting Proceedings. Meeting held March 14, 2002, in Barrow, Alaska. Minutes on file at BLM Arctic Field Office, Fairbanks, Alaska.

________. **2004.** Final NPR-A Subsistence Advisory Panel Meeting Proceedings. Meeting held March 16, 2004, in Nuiqsut, Alaska. Minutes on file at BLM Arctic Field Office, Fairbanks, Alaska.

________. **2005.** Final NPR-A Subsistence Advisory Panel Meeting Proceedings. Meeting held December 8, 2005, in Barrow, Alaska. Minutes on file at BLM Arctic Field Office, Fairbanks, Alaska.

________. **2006a.** Final NPR-A Subsistence Advisory Panel Meeting Proceedings. Meeting held March 23, 2006, in Barrow, Alaska. Minutes on file at BLM Arctic Field Office, Fairbanks, Alaska.

________. **2006b.** Final NPR-A Subsistence Advisory Panel Meeting Proceedings. Meeting held August 3, 2006, in Wainwright, Alaska. Minutes on file at BLM Arctic Field Office, Fairbanks, Alaska.

________. **2011.** Draft NPR-A Subsistence Advisory Panel Meeting Proceedings. Meeting held November 15 & 16, 2011, in Fairbanks, Alaska. Transcript on file at BLM Arctic Field Office, Fairbanks, Alaska.

U.S. Department of the Interior, Bureau of Land Management and Department of Energy. 2003. Energy Efficiency and Renewable Energy Assessing the Potential for Renewable Energy on Public Lands. February 2003

U.S. Department of the Interior, Bureau of Land Management and Ducks Unlimited, Inc. 2002. National Petroleum Reserve-Alaska Earth Cover Classification. Technical Report 40. 81 pages.

U.S. Department of the Interior, Bureau of Land Management and Minerals Management Service (USDOI BLM and MMS). 1998. Northeast National Petroleum Reserve – Alaska, Final Integrated Activity Plan/Final Environmental Impact Statement. Volumes I and II. BLM/AK/PL-98/016+3130+930. U.S. Department of the Interior, Bureau of Land Management and Minerals Management Service, Anchorage, Alaska.

________. **1998b.** Record of Decision for the Northeast National Petroleum Reserve – Alaska Integrated Activity Plan/Environmental Impact Statement. U.S. Department of Interior, Bureau of Land Management, Anchorage, Alaska.

________. **2003.** Northwest National Petroleum Reserve – Alaska, Final Integrated Activity Plan/Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management and Minerals Management Service, Anchorage, Alaska.

U.S. Department of the Interior, Bureau of Ocean Energy Management (USDOI BOEM). 2010. Alaska Outer Continental Shelf, Chukchi Sea Planning Area Environmental Assessment. OCS EIS/EA BOEMRE 2010-020.

________. **2011.** Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017. Draft Environmental Impact Statement. USDOI, BOEM, Headquarters. Herndon, VA. OCS EIS/EA BOEM 2011-001. 1,492 p. November 2011.

________. **BOEMRE 2011.** Chukchi Sea Planning Area Oil and Gas Lease Sale 193 in the Chukchi Sea Alaska Final Supplemental EIS. OCS EIS/EA, MMS 2010-0041. Anchorage, AK: USDOI, BOEMRE, Alaska OCS Region.

________. **2011.** Alaska Outer Continental Shelf, Chukchi Sea Planning Area Environmental Assessment. July 2011. OCS EIS/EA BOEMRE 2010-020.

________. **2012.** Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017. Final Programmatic Environmental Impact Statement. USDOI, BOEM, Headquarters. Herndon, VA. OCS EIS/EA BOEM 2012-030. 2,057 pp.

U.S. Department of the Interior, Fish & Wildlife Service (USFWS). 1970. List of endangered foreign fish and wildlife. Federal Register 35:18319-18322.

________. **1993.** Notice for listing of Spectacled eider. Federal Register 58(88):27474-27480.

________. **1997.** Notice of listing of Steller's Eiders. Federal Register 62(112):31748-31757.

________. **1999.** Guide to Management of Alaska's Land Mammals. U.S. Department of Interior, U.S. Fish and Wildlife Service, Office of Subsistence Management, Anchorage, Alaska.

________. **2001.** Endangered and threatened wildlife and plants; Final Determination of Critical Habitat for the Spectacled Eider; Final Rule. Federal Register 66:9146 - 9185.

________. **2002.** Steller's Eider Recovery Plan. Fairbanks, Alaska. 27 pp.

________. **2004.** Adaptive Harvest Season. U.S. Dept. Interior, Washington, D.C. 39 pp.

________. **2004.** Endangered and threatened wildlife and plants; review of species that are candidates or proposed for listing as endangered or threatened; annual notice of findings on resubmitted petitions; annual description of progress on listing actions; notice of review; proposed rule. Federal Register 69(86):24875–24904.

________. **2006.** Action plan for the Pacific common eider. U.S. Fish and Wildlife Service, Anchorage, Alaska. Unpublished. report. 55 pp. + appendices.

________. **2008.** Marine mammals; incidental take during specified activities. Federal Register 73:33212-33255.

________. **2008.** Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Polar Bear (*Ursus maritimus*) Throughout Its Range; Final Rule. Federal Register 73: 28211-28303.

________. **2009.** Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the Yellow-Billed Loon as Threatened or Endangered. Federal Register 74(56):12932-12968.

________. **2009.** Species assessment and listing priority assignment form for Kittlitz's murrelet. Unpublished document, U.S. Fish and Wildlife Service, Anchorage Fish and Wildlife Field Office, Anchorage, Alaska.

________. **2009.** Endangered and Threatened Wildlife and Plants: 90-Day Finding on a Petition To List the Pacific Walrus as Threatened or Endangered Federal Register/ Vol. 74, No. 174/ Thursday September 10, 2009/ Proposed Rules.

________. **2010.** Five-Year Status Review of the Spectacled Eider. http://ecos.fws.gov/docs/five_year_review/doc3281.pdf.

________. **2010.** North Slope Walrus Haul-out Update. September 22, 2010 Press Release. http://alaska.fws.gov.

________. **2010.** Final Revised Chukchi/Bering Seas Stock Assessment Report for Polar Bears. Available at: http://alaska.fws.gov/fisheries/mmm/stock/final_cbs_polar_bear_sar.pdf (also published 2009 74 FR 69139).

________. **2010.** Final Revised Stock Assessment Report for Pacific Walrus. Available on Internet at http://alaska.fws.gov/fisheries/mmm/walrus/reports.htm.

________. **2011.** Programmatic Biological Opinion for Polar Bears (*Ursus maritimus*), Polar Bear Critical Habitat, and Conference Opinion for the Pacific Walrus (*Odobenus rosmarus divergens*) on Beaufort Sea Incidental Take Regulations. Fairbanks, Alaska.

________. **2011.** Public Use Summary Arctic National Wildlife Refuge (ANWR) (http://arctic.fws.gov/pdf/pureportap2010.pdf, accessed Nov 3, 2011)

________. **2011.** Wild and Scenic River Suitability Report: Arctic National Wildlife Refuge. February 2011. Available at: http://arctic.fws.gov/pdf/ccpwsrsuitabilityd.pdf

________. **2011.** Endangered and Threatened Wildlife and Plants: 90-Day Finding on a Petition to List the Red Knot subspecies *Calidris canutus roselaari* as Endangered. Federal Register 76(2):304-311.

________. **2011e**. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Pacific Walrus as Endangered or Threatened. Federal Register / Vol. 76, No. 28 / Thursday February 10, 2011 / Proposed Rules.

U.S. Department of the Interior, Minerals Management Service. (USDOI MMS) 1987a. Alaska Outer Continental Shelf Beaufort Sea Sale 97 Final Environmental Impact Statement. Outer Continental Shelf Environmental Impact Statement/Environmental Assessment MMS 87-0069. Two Volumes. U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

________. **1987b.** Chukchi Sea Oil and Gas Lease Sale 109 Final Environmental Impact Statement. Outer Continental Shelf Report Environmental Impact Statement/Environmental Assessment MMS 87-011. U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

________. **1990.** Public Hearing, Official Transcript of Proceedings, Beaufort Sea Sale 124 Draft Environmental Impact Statement, April 17, 1990, Barrow, Alaska. U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

________. **1990.** Public Hearing, Official Transcript of Proceedings, Beaufort Sea Sale 124 Draft Environmental Impact Statement, April 19, 1990, Nuiqsut, Alaska. U.S. Department of the Interior, Minerals Management Service, Anchorage, Alaska.

________. **1992.** Alaska Outer Continental Shelf Region Human Relations Area Files, Inc. Social Indicators Study of Alaskan Coastal Villages, Key Informant Summaries: Schedule A Regions (North Slope, NANA, Calista, Aleutian-Pribilof), Volume 1, J.G. Jorgenson, Principal Investigator. Technical Report 151, Outer Continental Shelf Study MMS 92-0031. Anchorage, Alaska.

________. **1996a.** Beaufort Sea Planning Area Oil and Gas lease Sale 144 Final Environmental Impact Statement. Outer Continental Shelf Environmental Impact Statement MMS 96-0012. U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

________. **1996b.** Proceedings of the 1995 Arctic Synthesis Meeting, October 23-25, 1995, Anchorage, Alaska. U.S. Department of the Interior, Minerals Management Service, Anchorage, Alaska

________. **1998.** Beaufort Sea Planning Area Oil and Gas Lease Sale 170 Final Environmental Impact Statement. Outer Continental Shelf Environmental Impact Statement/Environmental Assessment MMS 98-0007. U.S. Department of Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

________. **2001. J.D. Craig, and K.W. Sherwood.** Summary of Economic Study of the Burger Gas Discovery, Chukchi Shelf, Northwest Alaska. July 2001.

________. **2001b.** Active Lease Summary Table. List of Alaska Region Lease Sales. Minerals Management Services, Alaska Region, U.S. Department of the Interior, [http://alaska.boemre.gov/lease/hlease/LeasingTables/act_lease_sum.pdf].

________. **2002.** Final Environmental Impact Statement: 2002. Renewal of the Federal Grant for the Trans-Alaska Pipeline System Right-of-Way. Bureau of Land Management - Alaska/PT 03/005+2880+990. Seven Volumes. U.S. Department of Interior, Bureau of Land Management, Anchorage, Alaska.

________. **2003.** Beaufort Sea Multiple Sale Final Environmental Impact Statement OCS EIS/EA MMS 2003-001 Anchorage, AK.

________. **2004.** Proposed OCS Lease Sale 195, Beaufort Planning Area: Environmental Assessment. U. S. Department of the Interior Minerals Management Service.

________. **2006.** North Slope Economy, 1962-2005, OCS Study MMS 2006-020, prepared for the Mineral Management Service by Northern Economics, Inc. in Anchorage, AK, April 2006.

________. **2006.** Biological Evaluation of the potential effects of oil and gas leasing and exploration in the Alaska OCS Beaufort Sea and Chukchi Sea Planning Areas on endangered bowhead whales (*Balaena mysticetus*), fin whales (*Balaenoptera physalus*), and humpback whales (*Megaptera novaeangliae*). U. S. Department of the Interior Minerals Management Service, Alaska OCS Region.

________. **2006b.** FINAL Programmatic Environmental Assessment: Arctic Ocean Outer Continental Shelf Seismic Surveys - 2006. U. S. Department of the Interior Minerals Management Service, Alaska OCS Region.

________. **2007a.** Chukchi Sea Planning Area Oil and Gas Lease Sale 193 and seismic surveying activities in the Chukchi Sea: Final Environmental Impact Statement. U.S. Department of the Interior Minerals Management Service, Alaska OCS Region, U.S. Department of Commerce, NOAA National Marine Fisheries Service.

________. **2007b.** Recent Geological and Geophysical Permit Applications.

________. **2008.** Alaska Outer Continental Shelf, Beaufort Sea and Chukchi Sea Planning Areas, Oil and Gas Lease Sales 209, 212, 217, 221. Draft Environmental Impact Statement OCS EIS/EA MMS 2008-0055. U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region.

________. **2009.** Bowhead Whale Feeding Ecology Study (BowFESt) in the Western Beaufort Sea 2009 Annual Report. 2009. Provided to: Environmental Studies Program Alaska Outer Continental Shelf Region. Minerals Management Service. 94 East 36th Avenue, 3rd Floor Anchorage, Alaska 99508-4363. Submitted through: National Marine Mammal Laboratory Alaska Fisheries Science Center, F/AKC4 7600 Sand Point Way, NE, Seattle WA 98115-0070 Phone: 206-526-4018; FAX 206-526-6615.

U.S. Department of the Interior, National Park Service (NPS). 2012. Nationwide Rivers Inventory. NPS web page: http://www.nps.gov/ncrc/programs/rtca/nri/eligb.html (accessed 5 January 2012).

U.S. Department of Labor. 2011. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Washington, D.C.

U.S. Environmental Protection Agency (U.S. EPA). 2000. Health Effects Fact Sheet: Benzene. Available at: http://www.epa.gov/ttn/atw/hlthef/benzene.html. Accessed Nov. 10, 2011.

_______. **2000.** Health Effects Fact Sheet: Toluene. Available at: http://www.epa.gov/ttn/atw/hlthef/toluene.html. Accessed Nov. 10, 2011.

_______. **2000.** Health Effects Fact Sheet: Xylenes. Available at: http://www.epa.gov/ttn/atw/hlthef/xylenes.html. Accessed Nov. 10, 2011.

_______. **2005.** Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2003. 430-R-05-003.

_______. **2006.** Regulatory Impact Analysis: 2006 National Ambient Air Quality Standards for Particle Pollution. Online at http://www.epa.gov/ttn/ecas/ria.html

_______. **2010.** National Ambient Air Quality Standards (Last Modified June 3, 2010). Available online at: http://www.epa.gov/air/criteria.html

_______. **2010a.** Average Annual Criteria Pollutant Emissions for the North Slope Borough, Alaska for 2002.

_______. **2010b.** Clarification Memorandum. Applicability of Appendix W guidance for the 1-hour NO_2 National Ambient Air Quality Standard. June 28, 2010

_______. **2011.** Effects of Air Pollutants – Health Effects. Available at: http://www.epa.gov/eogapti1/course422/ap7a.html#table. Accessed Nov. 10, 2011.

_______. **2011a.** Clarification Memorandum. Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard, March 1, 2011.

_______. **2012.** Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2010, U.S. Environmental Protection Agency Report #PA 430-R-12-001.

U.S. Federal Energy Regulatory Commission (FERC). 2006. FERC, Report to Congress on progress made in licensing and constructing the Alaska natural gas pipeline. Feb. 1, 2006, accessed on web on March 9, 2007 at http://ferc.gov/legal/staff-reports/alaska-report.pdf.

U.S. Geological Survey (USGS). 1904-1959. Bulletins, Professional Papers and Geologic Notes. Reports by: Brooks, A.H.; Leffingwell, E.; Martin, G.C.; Miller, J.M., T. G. Payne and G. Gryc; Paige, S., W.T. Foran, and J.A Gilluly; Reed, J.C.; Schrader, E.C.; Smith, P.S., and J.B. Mertie.

________. **1992.** Environmental Status of 28 Oil and Gas Exploration Areas of Operation in the National Petroleum Reserve – Alaska.

________. **2000.** The National Hydrography Dataset: concepts and contents. Worldwide web address: http://nhd.usgs.gov/chapter1/chp1_data_users_guide.pdf.

________. **2006**, Examination of stream sediments around the Drenchwater deposit and application of results for assessment of potential shale-hosted Zn-Pb-Ag occurrences in the Howard Pass and Misheguk Mountain Quadrangles, unpublished report. Available through BLM, Solid Mineral Branch. 5 p., 9 plates.

________. **2010.** National Assessment of Oil and Gas Resources Update, December, 2010. http://certmapper.cr.usgs.gov/data/noga00/natl/graphic/2010/summary_10_final.pdf

________. **2011.** Walrus Haulout FAQ. http://alaska.usgs.gov/science/biology/walrus/

________. **2012.** Shale Gas and Shale Oil Resource Potential of the Alaska North Slope. Available at http://energy.usgs.gov/Miscellaneous/Articles/tabid/98/ID/146/Shale-Gas-and-Shale-Oil-Resource-Potential-of-the-Alaska-North-Slope.aspx, last accessed February 24, 2012.

U.S. Navy. 1958. Office of Naval Petroleum & Oil Shale Reserves. "Geological Survey Professional Paper #301", Government Printing Office.

U.S. Shorebird Conservation Plan. 2004. High Priority Shorebirds — 2004. Unpublished Report, U. S. Fish and Wildlife Service, 4401 N. Fairfax Dr., MBSP 4107, Arlington, VA, 22203 U.S.A. 5 pp.

URS Corporation. 2001. 2001 Lake Monitoring Study, National Petroleum Reserve - Alaska. Final Report Prepared for Phillips, Anchorage, AK.

________. **2003**. 2002 Hydrologic and Hydraulic Assessment, Fish Creek, Judy Creek and the Ublutuoch River, North Slope, Alaska; prepared by URS for Phillips Alaska, Inc., January 2003.

University of Alaska (UA). 2001. "UA helps BP, Phillips build 'people pipeline' in The Northern Light, January 30, 2001. http://www.thenorthernlight.org/2001/01/30/uahelpsbpphillipsbuildpeoplepipeline/

________. **2004.** University of Alaska; Directory of Alaska Student Outreach and Recruitment Programs.

________. **2009.** Alaska Science Forum. Arctic Haze on the Wane. Available online at: http://www.gi.alaska.edu/node/729

Utzinger J., K. Wyss., D.D. Moto, M. Tanner, and B.H. Singer. 2004. Community health outreach program of the Chad-Cameroon petroleum development and pipeline project. Clin Occup Environ Med 4(1): 9-26.Walls M, Johnson K, Whitbeck L, Hoyt D. 2006. Mental health and substance abuse services preferences among AI people of the northern Midwest. Community Mental Health Journal 42: 521-535.

Vacca, M.M. and C.M. Handel. 1988. Factors Influencing Predation Associated with Visits to Artificial Goose Nests. Journal of Field Ornithology 59(3):215-223.

Van Bree, P.J.H, D.E. Sergeant, and W. Hoek. 1977. A harbor porpoise, *Phocoena phocoena* from the Mackenzie River Delta, Northwest Territories, Canada. Beaufortia 26:99-105.

Vanderlaan A.S.M. and C. Taggart. 2007. Vessel collisions with whales: the probability of lethal injury based on vessel speed. Marine Mammal Science 23:144-156.

Van Stone, J. 1960. A successful combination of subsistence and wage economies on the village level. Economic Development and Cultural Change 8: 174-191.

Van Tuyn, P. 2000. Environmental Community Perspective. Presented at Established Oil and Gas Practices and Technologies on Alaska's North Slope Workshop, April 2000, Anchorage, Alaska.

Van Valin, W.B. 1941. Eskimoland Speaks, Caldwell, ID: The Caxton Printers, Ltd.

Van Zyll de Jong, C.G. 1975. The Distribution and Abundance of the Wolverine (*Gulo gulo*) in Canada. Canadian Field Naturalist 894:431-437.

Vasil'ev, S.A. 2001. The Final Paleolithic in Northeastern Asia: Lithic Assemblage Diversity and Explanatory Models. *Arctic Anthropology* 38(2):3-30

Verbrugge, L. and Middaugh J. 2004. Use of Traditional Foods in a Healthy Diet in Alaska: Risks in Perspective. Second Edition: Volume 1. Polychlorinated Biphenyls (PCBs) and Related Compounds. Alaska Division of Public Health, Department of Health and Social Services, State of Alaska.

Wahrhaftig, C. 1965. Physiographic Divisions of Alaska. USGS Professional Paper 482. U.S. Geological Survey, Anchorage, Alaska.

Wainwright Traditional Use Area Conservation Plan and Map Book. Available on line at: http://www.nature.org/wherewework/northamerica/states/alaska/preserves/art26348.html.

Walker, D.A., W. Acevedo, K.R. Everett, L. Gaydos, J. Brown, and P.J. Webber. 1982. LANDSAT-Assisted Environmental Mapping in the Arctic National Wildlife Refuge, Alaska. CRREL Report 82-37: U.S. Department of Defense, U.S. Army Corps of Engineers, CRREL.

_______, M.D. Walker, K.R. Everett, and P.J. Webber. 1985. Pingos of the Prudhoe Bay region Alaska. Arct. Alp. Res 17(3):321-336.

_______ and W. Acevedo. 1987. Vegetation and Landsat-Derived Land Cover Map of the Beechy Point Quadrangle, Arctic Coastal Plain, Alaska: U.S. Department of Defense, U.S. Army Corps of Engineers, CRREL, 63 p.

_______ and K.R. Everett. 1987. Road Dust and its Environmental Impact on Alaskan Taiga and Tundra. Arctic and Alpine Research 19(4):479-489.

________**, D.D. Cate, J. Brown, and C. Racine. 1987a.** Disturbance and Recovery of Arctic Alaska Tundra Terrain: A Review of Recent Investigations. Cold Regions Research and Engineering Laboratory Report 87-11. U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.

________**, P.J. Webber, E. Binnian, K.R. Everett, N.D. Lederer, E. Norstrand, and M.D. Walker. 1987b.** Cumulative Impacts of Oil Fields on Northern Alaskan Landscapes. Science 238:757-761.

________**. 1996.** Disturbance and Recovery of Arctic Alaskan Vegetation. Pages 55-71 In Landscape Function and Disturbance in Arctic Tundra, J.F. Reynolds and J.D. Tenhunen (eds.). Springer-Verlag, Berlin, Germany.

Walker, M.D., C.H. Wahren, R.D. Hollister, [and others]. 2006. Plant community responses to experimental warming across the tundra biome. Proc. National Academy Science. 103:1342-1346.

Walters, V. 1955. Fishes of Western Arctic America and Eastern Arctic Siberia: Taxonomy and Zoogeography. Bulletin of American Museum of Natural History 106:259-368.

Wang, M. and J.E. Overland. 2009. A sea ice free summer Arctic within 30 years? Geophys Res. Lett 36: doi 10.1029/2009GL037820.

Ward, D.H. and R.A. Stehn. 1989. Response of Brant and Other Geese to Aircraft Disturbance at Izembek Lagoon, Alaska. Final Report. Prepared by U.S. Department of Interior, U.S. Fish and Wildlife Service, Anchorage, Alaska, for U.S. Department of Interior, Minerals Management Service, Anchorage, Alaska.

________**, R. A. Stehn, and D.V. Derksen. 1994.** Response of staging brant to disturbance at the Izembek Lagoon, Alaska, Wildlife Society Bulletin 22:220-228.

________**, R.A. Stehn, W.P. Erickson, and D.V. Derksen. 1999.** Response of Fall-Staging Brant and Canada Geese to Aircraft Overflights in Southwestern Alaska. Journal of Wildlife Management 63(1):373-381.

Ward, N. 2007. The culture of traffic safety in rural America. University of Minnesota Center for Transportation Studies and AAA Foundation for Traffic Safety.

Wardle, C.S., T.J. Carter, G.G. Urquhart, A.D.F. Johnstone, A.M. Ziolkowski, G. Hampson, and D. Mackie. 2000. Effects of Seismic Air Guns on Marine Fish. Continental Shelf Research 21(8-10):1005-1027.

Warnock, N.D. and D.M. Troy. 1992. Distribution and Abundance of Spectacled Eiders at Prudhoe Bay, Alaska: 1991. Report Prepared by Troy Environmental Research Associates, Anchorage, Alaska, for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska.

________ **and R.E Gill. 1996.** Dunlin (*Calidris alpina*). *In* The Birds of North America, No. 203 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

Warren, J.A., J.E. Berner, and T. Curtis. 2005. Climate change and human health: infrastructure impacts to small remote communities in the north. International journal of circumpolar health. 64(5):487-497.

Warren, M.L. and M.G. Pardew. 1998. Road Crossings as Barriers to Small-Stream Fish Movement. Transactions of the American Fisheries Society 127:637-644.

Waters, T.F. 1995. Sediment in Streams: Sources, Biological Effects, and Control. American Fisheries Society Monograph 7. American Fisheries Society, Bethesda, MD.

Watkins, W.A., M.A. Daher, G.M. Reppucci. 2000. Seasonality and distribution of whale calls in the North Pacific. Oceanography 13(1):62-67.

Watson, R T., T. 1. Cade, M. Fuller, G. Hunt, and E. Potapov, Editors. 2011. Gyrfalcons and Ptarmigan in a changing world. Proceedings of the Conference. Vol. I, 372 pp. Vol. IT, 400 pp. The Peregrine Fund, Boise, ID.

Weimer, P. 1987. Northern Alaska Exploration – the Past Dozen Years. Pp. 31-37 in Alaska North Slope Geology, Volume I, I.I. Tailleur and P. Weimer (eds.). Pacific Section, Society of Economic Paleontologists and Mineralogists, Bakersfield, California, and Alaska Geological Society, Anchorage, Alaska.

Wein, R.W. 1976. Frequency and characteristics of arctic tundra fires. Arctic 29:213-222.

Weingartner, T.J. 1997. A Review of the Physical Oceanography of the Northeastern Chukchi Sea. Pages 40-59. In: Fish Ecology in North America, J.B. Reynolds, ed. American Fisheries Society, Bethesda, Maryland.

________ and S.R. Okkonen. 2001. Beaufort Sea Nearshore Under-Ice Currents: Science, Analysis, and Logistics. In: University of Alaska Coastal Marine Institute Final Report. OCS Study, MMS 2001-068. USDOI, MMS, Alaska OCS Region, Anchorage, Alaska.

________, S.R. Okkonen, and S.L. Danielson. 2005. Circulation and Water Property Variations in the Nearshore Alaskan Beaufort Sea: Final Report. MMS, OCS Study, MMS 2005-028, Anchorage, Alaska.

Weins, J.A. 1996. Oil, seabirds and science. BioScience 46:587-595.

Weir, R.D. 1976. Annotated bibliography of bird kills at man-made obstacles: a review of the state-of-the-art and solutions. Can. Wildl. Serv., Ont. Reg., Ottawa. 85 pp.

Weiser, E.L. and A.N. Powell. 2010. Does garbage in the diet improve the reproductive output of glaucous gulls? Condor 112(3):5230-538.

Weller, D.W., A.M. Burdin., B. Würsig. 2002. The western gray whale: a review of past exploitation, current status and potential threats. J. Cetacean Res. Manage. 4(1):7-12.

Wenger J.D., T. Zulz, D. Bruden, R. Singleton, M.G. Bruce, L. Bulkow, D. Parks, K. Rudolph, D. Hurlburt, T. Ritter, J. Klejka, and T. Hennessy. 2010. Invasive pneumococcal disease in Alaskan children: impact of the seven-valent pneumococcal conjugate vaccine and the role of water supply. Pediatr Infect Dis J. 29(3):251-6.

Werdon, M.B., R.J. Newberry, and L.E. Burns. 1996. Probabilistic estimate of mineral resources in the Colville mining district, Alaska: Alaska Division of Geological & Geophysical Surveys Report of Investigation 96-5, 33 p.

West, A. 2004. Marine pollution from vessel sewage in Queensland. MLAANZ Journal 18: 126-151.

West, F.H. 1981. *Archaeology of Beringia.* Columbia University Press, New York.

West, R.L. 1982. NPR-A Fisheries Contaminant Investigation. Report by U.S. Fish and Wildlife Service for Bureau of Land Management, Fairbanks, Alaska.

Western Arctic Caribou Herd Working Group. 2003. Western Arctic Caribou Herd Cooperative Management Plan. Nome, Alaska. 33 pp.

Western Regional Climate Center (WRCC). 2010. Period of Record Monthly Climate Summary for Barrow Weather Service Office (WSO) Airport, Kuparuk, Umiat, Prudhoe Bay, and Wainwright, Alaska. Historic Climate Information. Western U.S. Historical Summaries (Individual Stations), Historical Climate Information, Reno, Nevada. Available online at: http://www.wrcc.dri.edu/CLIMATEDATA.html

________. **2010a.** Remote Automated Weather Station (RAWS) Wind Roses. WRCC Projects, RAWS Climate Archive – Wind Rose Graph and Tables for Umiat and Noatak, Alaska. Available online at: http://www.raws.dri.edu/index.html

________. **2010b.** Cooperative Meteorology Station Maps. Available online at: http://www.wrcc.dri.edu/coopmap/

________. **2010c.** Remote Automated Weather Station (RAWS) Maps. Available online at: http://www.wrcc.dri.edu/wraws/

WesternGeco. 2003. Comments submitted to U.S. Department of Interior, Bureau of Land Management on the Draft Northwest NPR-A IAP/EIS.

Westing, C. 2008. Units 23 and 26A Dall sheep management report. pp. 150-161 in P. Harper, editor. Dall sheep management report of survey and inventory activities 1 July 2004-30 June 2007. Alaska Department of Fish and Game. Project 6.0. Juneau, Alaska.

Wetzel, D.L., T. Hepa, T.M. O'Hara, J.E. Reynolds, and C.E. Willetto. 2008. Risk to northern Alaskan Inupiat: assessing potential effects of oil contamination on subsistence lifestyles, health, and nutrition. Mote Technical Report No. 1262.

Whitbeck, L., G. Adams, D. Hoyt, and X. Chen. 2004. Conceptualizing and measuring historical trauma among American Indian people. American Journal of Community Psychology 33: 119-130.

White, B. 2011. "Guide to Alaska Natural Gas Projects" accessed September 2, 2011 at http://www.arcticgas.gov

White, C. M. 1968. Diagnosis and relationships of the North American tundra-inhabiting Peregrine Falcons. Auk 85: 179-1 9 1.

________ **and T.J. Cade. 1971.** Cliff-Nesting Raptors and Ravens along the Colville River in Arctic Alaska. Living Bird 10:107-150.

________**, N.J. Clum, T.J. Cade, and W.G. Hunt. 2002.** Peregrine Falcon (*Falco peregrinus*). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Laboratory of Ornithology; Retrieved from The Birds of North American Online database: http://bna.birds.cornell.edu/BNA/account/Peregrine_Falcon/.

White, R.G., B.R. Thomson, T. Skogland, S.J. Person, D.E. Russell, D.F. Holleman, and J.R. Luick. 1975. Ecology of caribou at Prudhoe Bay, Alaska. Biol. Pap. Univ. Alaska, Spec. Rep. 2:151-201.

________**, F.L. Bunnell, E. Garre, T. Skogland, and B. Hubert. 1981.** Ungulates on Arctic Ranges. Pages 397-483 *In* Tundra Ecosystems: A Comparative Analysis, International Biological Program, L.C. Bliss, O.W. Heal, and J.J. Moore (eds). Volume 25. Cambridge University Press, Cambridge, United Kingdom.

Whitman, M.S. 2002. A Protocol for Assessing the Impacts of Urbanization on Coho Salmon with Application to Chester Creek, Anchorage, Alaska. Master's Thesis. University of Alaska Fairbanks.

________**. 2010.** Presentation: Ice Road Stream Crossings: Fish Habitat and Passage Concerns. Arctic Ice and Snow Roads 2010 Conference: Advancements and Future Needs. Anchorage, AK, March 30, 2010. http://www.itsalaska.org/Ice2010_Program.html.

________**, S. Walker, and R.T. Kemnitz. 2011**. Fish Habitat Management and Monitoring Related to Oil and Gas Exploration in the National Petroleum Reserve – Alaska. BLM-Alaska Open File Report 124. Bureau of Land Management, Anchorage, AK.

Whitten, K.R. 1983. Movements of collared caribou, *Rangifer tarandus*, in relation to petroleum development on the Arctic Slope of Alaska. Canadian. Field-Naturalist. 97(2):143-146.

________**. 1997.** Mammals of the Northeastern NPR-A. In NPR-A Symposium Proceedings: Science, Traditional Knowledge, and the Resources of the Northeast Planning Area of the National Petroleum Reserve – Alaska, April 16-18, 1997, Anchorage, Alaska.

________ **and R.D. Cameron. 1980.** Nutrient dynamics of caribou forage on Alaska's Arctic Slope. In Proceedings of the Second International Reindeer/Caribou Symposium, September 17-21, 1979, Roros, Norway, E. Reimers, E. Gaare, and S. Skjenneberg (eds.). Direktoratet for vilt og ferskvannfisk, Trondheim, Norway.

Wiggins, D.A. 2008. COSEWIC assessment and update status report of the Short-eared Owl (*Asio flammeus*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa.

_______, **D.W. Holt and S.M. Leasure. 2006.** Short-eared Owl (*Asio flammeus*). In The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America.

Wilcox, W.J. II. 2001. The Origin and Composition of Aerosols in the Alaska Airshed, Ph.D. Thesis, University of Alaska Fairbanks, Department of Chemistry. Available online at: http://www.researchgate.net/publication/34038274_The_origin_and_composition_of_aerosols_in_the_Alaskan_airshed

Wiley, R.H. and D.S. Lee. 1998. Long-tailed Jaeger (*Stercorarius longicaudus*). *In* The Birds of North America, No. 365 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

_______ **and D.S. Lee. 1999.** Parasitic Jaeger (*Stercorarius parasiticus*). *In* The Birds of North America, No. 445 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

_______ **and D.S. Lee. 2000.** Pomarine Jaeger (*Stercorarius pomarinus*). *In:* The Birds of North America, Number 483. A. Poole and F. Gill (eds.). The Birds of North America, Philadelphia, Pennsylvania.

Willemsen, J. 1980. Fishery-aspects of Eutrophication. Aquatic Ecology 14(1-2):12-21.

Williams, J.R. 1970. Ground Water in the Permafrost Regions of Alaska. U.S. Geological Survey Professional Paper 696. U.S. Geological Survey, Anchorage, Alaska.

Williams, M.T. 2002. Introduction and Description of British Petroleum Activities. Chapter 1 In Monitoring of Industrial Sounds and Whale Calls During Construction of British Petroleum's Northstar Oil Development, Alaskan Beaufort Sea, Summer and Autumn 2001: 90-day Report, W.J. Richardson (ed.). Report Prepared by LGL Ltd., King City, Ontario, and Greenridge Sciences, Inc., Santa Barbara, California, for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska, and U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, Maryland.

_______, **Smith TG, Perham CJ. 2002.** Ringed seal structures in sea ice near Northstar, winter and spring of 2000-2001. p. 4-1 to 4-33 In: W.J. Richardson and M.T. Williams (eds., 2001, q.v). LGL Rep. Pp. 485-2.

_______ **and R. Rodrigues. 2003.** Monitoring of Industrial Sounds and Whale Calls During Construction of British Petroleum's Northstar Oil Development, Alaskan Beaufort Sea, Summer and Autumn 2002: 90-day Report. Report Prepared by LGL Ltd., King City, Ontario, and Greenridge Sciences, Inc., Santa Barbara, California, for British Petroleum Exploration-Alaska, Inc., Anchorage, Alaska, and U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, Maryland.

Williams, W.D. 2001. Anthropogenic Salinization of Inland Waters. Hydrobiologia 466:329-337.

Williamson, F.S.L., M.C. Thompson, and J.Q. Hines. 1966. Avifaunal Investigations. *In* N. J. Wilimovsky and J. N. Wolfe [eds.], Environment of Cape Thompson Region, Alaska. Atomic Energy Comm., p. 437-480.

Wilkinson, R. and M. Marmot. 2003. Social Determinants of Health: the Solid Facts. World Health Organization, Copenhagen, Denmark. Accessed online on October 13, 2011, at http://www.euro.who.int/__data/assets/pdf_file/0005/98438/e81384.pdf

Wilson, R.R., M.A. Smith, N. Walker, E. Whitten, L. Chartier, and W. Loya. 2011. Cumulative impacts of development on Teshekpuk Caribou Herd calving habitat. The Wildlife Society Annual Conference, Kona, HI.

________, A.K. Prichard, L.S. Parrett, [and others]. (MS Submitted). Summer resource selection by the Teshekpuk Caribou Herd in northern Alaska. J. Wildlife Management.

Wilson. W. 2001. Marine Discharges. Prepared by LGL Ecological Research Associates, Inc. Anchorage, Alaska, for TAPS Owners, Anchorage, Alaska.

Winterowd, C., R.S. Harrist, N. Thomason, S. Worth, and B.L. Carlozzi. 2005. The relationship of spiritual beliefs and involvement with the experience of anger. Journal of College Student Development 46: 517–531.

Winters, J.F., P.K. Weber, A.L. DeCicco, and N. Shishido. 1988. An Annotated Bibliography of Selected References of Fishes of the North Slope of Alaska, with Emphasis on Research Conducted in National Petroleum Reserve - Alaska. Report by Alaska Department of Fish and Game, Division of Habitat and Subsistence for North Slope Borough, Department of Wildlife Management, Barrow, Alaska.

________ and R.T. Schideler. 1990. An Annotated Bibliography of Selected References of Muskoxen Relevant to the National Petroleum Reserve – Alaska. Alaska Department of Fish and Game, Fairbanks, Alaska.

Witteveen B.H., R.J. Foy, K.M. Wynne, and Y. Tremblay. 2008. Investigations of foraging habits and prey selection by humpback whales (*Megaptera novaeangliae*) using acoustic tags and concurrent fish surveys. Marine Mammal Science 24(3): 516-534.

Wolfe, R.J. and R.J. Walker. 1987. Subsistence Economies in Alaska: Productivity, Geography, and Development Impacts. Arctic Anthropology 24 (2): 56-81.

Wolfe, S.A. 2000. Habitat Selection by Calving Caribou of the Central Arctic Herd, 1980-1995. M.S. Thesis. University of Alaska, Fairbanks, Alaska.

Woo, M. and X. Guan. 2006. Hydrological Connectivity and Seasonal Storage Change of Tundra Ponds in a Polar Oasis Environment. Canadian High Arctic: Permafrost and Periglacial Processes 17:309-323.

Woodby, D.A. and D.B. Botkin. 1993. Stock sizes prior to commercial whaling. *In*: Burns, J.J., Montague, J.J., and Cowles, C.J. (eds.). The Bowhead Whale. Special Publication Number 2 of the Society of Marine Mammalogy. Allen Press, Inc. Lawrence, KS.

Woodward, D.F., E. Snyder-Conn, R.G. Riley, and T.R. Garland. 1988. Drilling fluids and the Arctic tundra of Alaska: Assessing contamination of wetlands habitat and the toxicity to aquatic invertebrates and fish. Archives of Environmental Contamination and Toxicity 17:683-697.

Woodward-Clyde Consultants. 1980. Gravel Removal Studies in Arctic and Sub-Arctic Floodplains in Alaska. FWS/OBS-80/08. Prepared by Woodward-Clyde Consultants, Anchorage, AK. Prepared for U.S. Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C.

________. **1983.** Lisburne Development Area: 1983 Environmental Studies. Final Report. Prepared by Woodward-Clyde Consultants, Inc., for ARCO Alaska, Inc., Anchorage, Alaska.

Worl, R. 1979a. Sociocultural Assessment of the Impact of the 1978 International Whaling Commission Quota on the Eskimo Communities. University of Alaska, Arctic Environmental and Information Data Center, Anchorage, Alaska.

________. **1979b.** Values of Subsistence to North Slope Inupiat Culture, pp. 17-26, Native Livelihood and Dependence: A Study of Land Use Values Through Time. Prepared by North Slope Borough Contract Staff for National Petroleum Reserve in Alaska Work Group 1, Field Study 1, June 1979. Department of the Interior, National Petroleum Reserve in Alaska, Anchorage, AK.

________ **and North Slope Borough. 1980.** Economic Impacts of Subsistence (NSB Contract 105(c) Study).

World Health Organization. 2009. Night Noise Guidelines for Europe. Denmark: World Health Organization

Wright, D.G. 1982. A Discussion Paper on the Effects of Explosives on Fish and Marine Mammals in the Waters of the Northwest Territories. Canadian Manuscript Report of Fisheries and Aquatic Sciences 2107.

Würsig, B., E.M. Dorsey, M.A. Fraker, R.S. Payne, and W.J. Richardson. 1985. Behavior of bowhead whales, *Balaena mysticetus,* summering in the Beaufort Sea: a description. Fishery Bulletin, U.S. 83:357-377.

Yager, G.C. 2011. The Impact of the Endicott Causeway on Sediment Transport in the Sagavanirktok River Delta, North Slope Alaska. M.S. Thesis. University of Alaska Anchorage.

Yakubu, B.M., H. Ma, and C.Y. Zhang. 2009. Biodegradation of crude oil in soil using chicken manure. International Journal of Environment and Pollution, 36: 400-410.

Yazvenko, S.B., T.L. McDonald , S.A. Blokhin, S.R. Johnson, H.R. Melton, and M.W. Newcomer. 2007. Feeding of western gray whales during a seismic survey near Sakhalin Island, Russia. Environmental Monitoring and Assessment. 134:93-106.

Yen, I.H. and S.L. Syme. 1999. The social environment and health: a discussion of the epidemiologic literature. Annual review of public health 20(1): 287-308.

Yershov, R.D., E.M. Chuvilin, O.G. Smirnova, and N.S. Naletova. 1997. Interaction of Oil with Frozen Soils. Pages 381-384 In Ground Freezing 97: Frost Action in Soils, S. Knutsson (ed.). A.A. Balkema, Rotterdam, Amsterdam.

Yokel, D. (ed.). 1999. Proceedings of the National Petroleum Reserve-Alaska Raptor Disturbance and Mitigation Workshop. U.S. Dept. of the Interior, Bureau of Land Management, Fairbanks, AK. 28pp.

_______, D. Huebner, R. Meyers, D. Nigro, and J. Ver Hoef. 2007. Offsetting versus overlapping ice road routes from year to year: impacts to tundra vegetation. BLM Alaska Open File Report 112. 22 pp.

_______, A. Prichard, G. Carroll, L. Parrett, B. Person and C. Rea. 2009. Teshekpuk Caribou Herd movement through narrow corridors around Teshekpuk Lake, Alaska. Alaska Park Science 8(2): 64-67.

Young, D.D. and T.R. McCabe. 1997. Grizzly bear predation rates on caribou calves in northeastern Alaska. J. Wildl. Manage. 61: 1056-1066.

Young, L.E. 2004. A Geologic Framework for Mineralization in the Western Brooks Range, Alaska, Economic Geology, Vol. 99, pp. 1281-1306.

Young T., C. Schraer, E. Shubnikoff, E. Szathmary, and Y. Nikitkin. 1992. Prevalence of diagnosed diabetes in circumpolar indigenous populations. International Journal of Epidemiology 21(4): 730–736.

Yunker, M.B. and R.W. MacDonald. 1995. Composition and Origins of Polycyclic Aromatic Hydrocarbons in the Mackenzie River and on the Beaufort Sea Shelf. Arctic 48 (2):118-129.

Zeh, J.E., C.W. Clark, J.C. George, D. Withrow, G.M. Carroll, and W.R. Koski. 1993. Current population size and dynamics. pp 409-489. In: J.J. Burns and J.J Montague and C.J. Cowles (eds.). The Bowhead Whale. Special publication No. 2 of the Society of Marine Mammalogy. i-xxxvi + 787pp.

_______, D. Poole, G. Miller, W. Koski, L. Baraff, and D. Rugh. 2002. Survival of bowhead whales, *Balaena mysticetus*, estimated from 1981-98 photo-identification data. Biometrics 58:832-840.

_______ and A.E. Punt. 2005. Updated 1978–2001 abundance estimates and their correlations for the Bering-Chukchi-Beaufort Seas stock of bowhead whales. *J. Cetacean Res. Manage* 7(2): 169–75.

Zimmerman, M.A., J. Ramirez-Valles, K.M. Washienko, B. Walter, and S. Dyer. 1996. The development of a measure of enculturation for Native American youth. American Journal of Community Psychology 24: 295-310.

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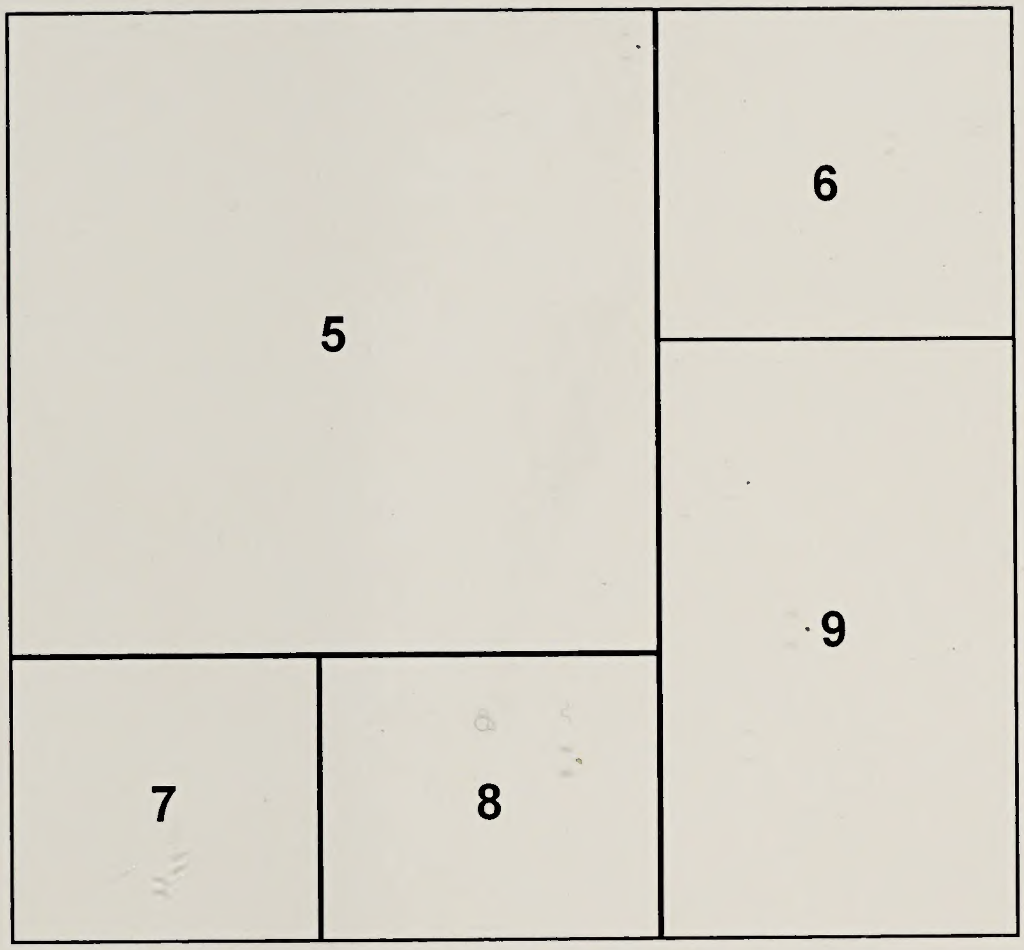

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5. Coastal erosion due to warming permafrost shoreline, National Petroleum Reserve-Alaska. Photo by University of Texas.

6. Arctic Fox, National Petroleum Reserve-Alaska.

7. Transporting exploration drill rig equipment, National Petroleum Reserve-Alaska. Photo by NSSI.

8. Bear flowers on a thermokarst slump along the Colville River, National Petroleum Reserve-Alaska. © Richard Kahn

9. Subsistence ice fishing, Nuiqsut, Alaska. Photo by NSSI.